U.S. Navy Medicine

October 1976

...nce Davis, Jr.
...Submarine Medicine Technician

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U.S. NAVY MEDICINE

Volume 67, Number 10, October 1976

COVER: HMCS Lawrence Davis, Jr., is senior hospital corpsman and assistant to the medical officer on board the world's largest diesel-powered submarine—the USS *Grayback*. Our cover shows him in the command and control center, where he is chief of the watch. HMCS Davis talks about his work aboard the *Grayback* beginning on page 4.

Department Rounds

Prevention

Flu Watch

Avoid the hug,
Avoid the lip,
Escape the bug
That gives the grippe.

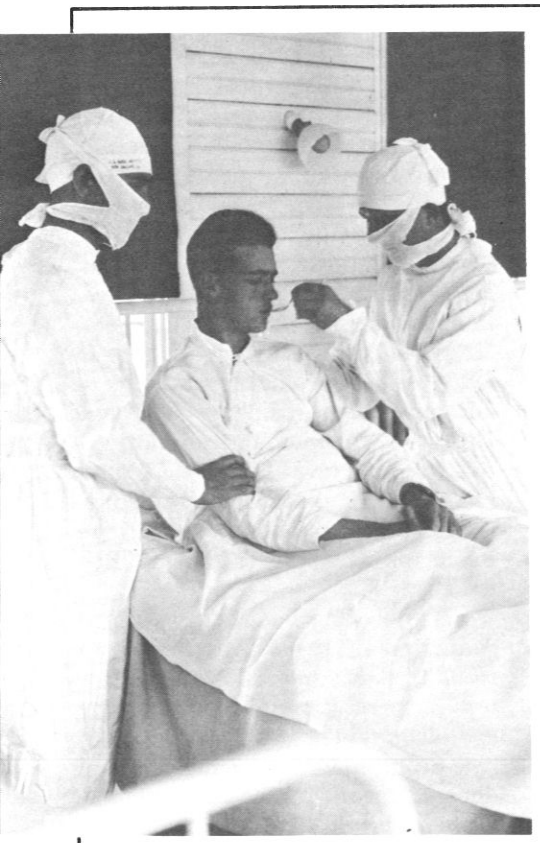
That was how the Navy Medical Department advised sailors to steer clear of the 1918-19 swine flu pandemic. This year, with outbreaks of swine flu again predicted, the Medical Department is taking a more modern tack: a vaccination program to protect active-duty Navy and Marine Corps personnel, high-risk beneficiaries, and others eligible for Navy-sponsored health care.

With setbacks in the National Influenza Immunization Program finally resolved, 10.5 million doses of vaccine are on their way to military medical facilities all over the world. Shipment of bivalent vaccine with influenza type A/New Jersey (swine flu) and type A/Victoria components began in early October. Each 1 ml dose of this vaccine contains 400 chick cell agglutinating units of A/New Jersey and A/Victoria antigens.

As outlined in BUMED Note 6230 of 27 May 1976, all active-duty personnel except the few with documented medical contraindications must receive the bivalent vaccine, a whole virus product determined by the Armed Forces Epidemiological Board to be an effective immunizing agent for all age groups of the military population.

In addition, influenza type B/Hong Kong vaccine is mandatory for alert forces, Officer Candidate School students, Naval Academy midshipmen, recruits, Medical Department personnel and active-duty Navy and Marine Corps personnel stationed outside the 50 states. Type B/Hong Kong vaccine was distributed to Navy medical facilities in September, with vaccination of alert forces and overseas active-duty personnel to begin immediately.

Top priority. By protecting backbone personnel against influenza, the Medical Department aims to maintain the Navy's operational readiness and limit morbidity. But



Influenza patient at Navy Hospital New Orleans in 1918

Influenza: The Way It Was

The new swine flu strain, A/New Jersey/8/76, appears to be closely related but not identical to the flu strain that killed more than 500,000 Americans, including some 4,800 Navy and Marine Corps personnel, in 1918-19. Almost 40% of all Navy and Marine Corps personnel were infected during that outbreak.

Ships operating in the North Atlantic were lucky. Only a few days out of port, they were able to transfer ill sailors to a shore naval hospital, limiting the spread of infection on board naval vessels. Less fortunate were ships in the South Atlantic: on the USS *Pittsburgh*, an armored cruiser sailing near Rio de Janeiro, 649 men or nearly 80% of the crew came down with flu in six weeks; 58 (9%) of these patients died.

In Guam, China, Japan and the Philippines, flu was much milder among Americans and Europeans than among the indigenous population. The highest incidence of infection was in Europe and on the U.S. East Coast. Navy hospitals on both sides of the Atlantic bulged with more than 120,000 influenza admissions. Warehouses and armories were used to house this huge influx of patients, most of whom were between 20 and 30 years old.

Without vaccines, medical officers could do little. Liberty was restricted and partial quarantine used in a futile effort to stop the disease from spreading. Some medical officers recommended wearing face masks; others recommended spraying throats daily with Silvol. Both were to no avail.

By the spring of 1919, the pandemic had run its course. But the ravages of this and subsequent outbreaks are still remembered, lending urgency to the 1976 influenza vaccination program.

while active-duty personnel have top priority in the immunization program, other people eligible for Navy health care will also be offered protection: in a second phase of the program, Navy health care beneficiaries considered to have an above-average risk of dying from swine flu—people aged 65 and older, or with chronic illnesses—will be vaccinated on a voluntary basis, and on their physician's recommendation, with a bivalent vaccine. This group may also receive the influenza B/Hong Kong vaccine.

Finally, remaining Navy health care beneficiaries who are older than 18 years will be given a monovalent influenza type A/swine vaccine on a voluntary basis. The vaccine for these beneficiaries contains 200 chick cell agglutinating units of antigen per 0.5 ml; the vaccine is expected to reach commands sometime after the middle of October.

Exactly when the flu vaccine will arrive depends upon the manufacturers' delivery dates and the logistic efficiency of the supply system. Distribution of vaccines will generally follow the priorities listed in BUMED Note 6710 of 21 June 1976. Vaccines may be administered either by needle or jet gun. Because the vaccines deteriorate when surrounding temperatures rise, they will be shipped and stored under refrigeration. Influenza A vaccines will be provided without cost to individual commands.

The Center for Disease Control, Atlanta, Ga., has warned that although 143 million doses of monovalent and bivalent vaccine were ordered, U.S. manufacturers will only be able to supply 113 million doses this season. Although doses available to the Department of Defense should be adequate, careful distribution and redistribution will be required to assure effective programs. BUMED will notify commands when details of the redistribution system are worked out.

Reactions. While a few people may develop systemic reactions such as fever, chills, headaches or muscle aches in the first 48 hours after they are vaccinated, the flu vaccines of recent years have rarely produced severe side effects. According to the Center for Disease Control, most people will have no side effects from the vaccine, although the site of the shot may be tender for several days. Some groups, however, should be cautious about receiving the flu vaccine:

- Vaccine is not recommended for non-active-duty beneficiaries less than 18 years of age.
- People allergic to eggs may receive vaccine, but only under close medical supervision.
- People with a fever should wait until the fever subsides before they are vaccinated.
- People who have received another type of vaccine within the previous 14 days should consult a physician before receiving the flu vaccine.

Informed consent will be required of all recipients except active-duty personnel, for whom the immunizations are mandatory. DOD plans to distribute a consent form designed by the Center for Disease Control and modified to include a Privacy Act statement.

BUMED

New MSC Chief

CAPT William J. Green, Jr. (MSC) has been named sixth chief of the Medical Service Corps. He succeeds CAPT Albert J. Schwab (MSC), who retired on 1 September.

CAPT Green will also serve as assistant chief for regional health care administration at the Bureau of Medicine and Surgery.

Born 23 Dec 1921 in Dighton, Kans., CAPT Green enlisted in the Navy in 1939. He was appointed chief pharmacist's mate in 1943,

CAPT Green

and later served on independent duty in the Mediterranean and Europe.

CAPT Green was commissioned an ensign in the Medical Service Corps in 1952, and was subsequently assigned to the Naval School of Hospital Administration, Bethesda, Md.; Naval Hospital, St. Albans, N.Y.; Able Company, 1st Medical Battalion, First Marine Division; and the Naval Dispensary, Washington, D.C. After receiving a bachelor's degree in business administration from Georgetown University in 1958, he taught financial management at the Naval School of Hospital Administration until 1960, when he entered a full-time graduate program in hospital administration at the University of Minnesota. He received his master's degree in 1962, and then held the positions of administrative resident at Naval Hospital, Philadelphia; administrative officer, Naval Hospitals, Portsmouth, N.H. and Camp Lejeune, N.C.; and executive assistant to the Inspector General, Medical, BUMED.

In 1972 CAPT Green assumed command of the Naval School of Health Care Administration. His tenure there was highlighted by the establishment of an executive medicine program for senior medical and dental officers, an orientation program for newly commissioned medical and dental officers, and a two-week seminar for new commanding officers.

Hospital Corps

Burns Hall Named for Corpsman Hero

Burns Hall, a new $560,000 bachelor enlisted quarters at Naval Aerospace and Regional Medical Center, Pensacola, Fla., was dedicated this summer in honor of HM3 Dewey R. Burns, killed 13 Sept 1969 while serving with the Third Marine Amphibious Force in Vietnam.

A native of Greenville, Tex., HM3 Burns was awarded the Navy Cross posthumously for extraordinary heroism giving medical aid to wounded civilians and military personnel in the face of heavy enemy fire, even after being seriously wounded.

The citation accompanying his award details HM3 Burns' heroism:

During a concentrated enemy attack upon the village of An Phong in Quang Ngai Province, Petty Officer Burns on several occasions charged across the fire-swept terrain, rendered medical aid to wounded civilians and defending soldiers and marines, and carried them to positions of safety. . . . Observing that the platoon's interpreter was wounded and had fallen in the direct line of fire of enemy machine guns, Petty Officer Burns directed nearby Marines to provide covering fire and raced to the side of the casualty. Although he, himself, was seriously wounded while treating the fallen interpreter, he resolutely continued his life-saving actions until he had stopped his patient's bleeding. He then commenced leading his charge toward a location of relative security, but was mortally wounded before he could attain his objective.

According to the citation, HM3 Burns' valiant actions inspired the other members of his platoon to heroic efforts, resulting in the complete routing of the enemy.

"By his intrepid fighting spirit, daring initiative, and unwavering devotion to duty, [HM3 Burns] succeeded in saving several lives, and upheld the highest traditions of the United States Naval Service," the citation records.

HM3 Burns also was awarded the Vietnamese Military Merit Medal and the Vietnamese Gallantry Cross with Palm.

Burns Hall, which honors the memory of this courageous corpsman, comprises 11 modular units featuring four bedroom-bathroom combinations around a central lounge. Women are quartered on the first floor and men on the second floor of the complex, which can house 116 people.

Pensacola's Burns Hall

Dental

Award Winning Graduates

Twenty-nine dental officers received certificates of residency and a new award was introduced at this year's National Naval Dental Center graduation ceremonies.

Nine officers completed one-year residencies in comprehensive dentistry, among them Great Britain's Surgeon Commander Edward J. Grant of the Royal Navy. Another 19 officers completed two-year residencies in comprehensive dentistry, endodontics, periodontics or prosthodontics, and one officer finished three years of advanced training in maxillofacial prosthetics.

Presented this year for the first time was the Chief of the Navy Dental Corps Award for Excellence in Comprehensive Dentistry, won by LCDR Robert L. Pentecost (DC).

LCDR Michael T. Hanst (DC) won the Commanding Officer's Award for General Excellence, given annually to the outstanding naval officer under instruction; selection is based on the resident's overall performance in every area of professional life.

LCDR Hanst shared the National Naval Dental Center Award for Achievement in Research Methods with fellow graduate LCDR Stephen A. Fertig (DC); the two officers were honored for their performance in an original research investigation.

The Commanding Officer's Award for Excellence in Operative Dentistry, honoring professional judgment, expertise and clinical practice in the field of operative dentistry, went to LCDR Thomas L. Silverthorn (DC).

Herbert K. Cooper, D.D.S., founder and director emeritus of the Lancaster (Pa.) Cleft Palate Clinic, received the Commanding Officer's Annual Award for Civism.

On Duty

"I Wanted To Be the Best"

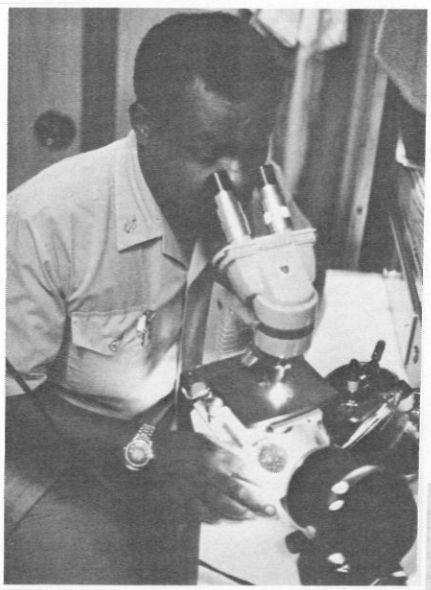
HMCS Lawrence Davis, Jr., "can do no wrong," according to sailors aboard the world's largest diesel-powered submarine, the USS *Grayback*, where he is senior hospital corpsman and assistant to the medical officer. He's also a qualified chief of the watch in the *Grayback*'s command and control center, helping to coordinate the submarine's movements and activities.

HMCS Davis' career on submarines began in 1965—after he had completed basic and advanced Hospital Corps School, and had served as a field hospital corpsman with the Pacific Fleet Marine Force. He also spent two years as an aerospace medicine technician before deciding to volunteer for submarine duty. "I liked what I learned about its camaraderie, challenges, and responsibilities," HMCS Davis says, "and I wanted a chance to increase my knowledge of medicine. In the submarine service a corpsman's work is closely related to the work of a family doctor."

HMCS Davis believes that duty aboard a submarine gives a corpsman great opportunities for personal fulfillment. "Navy physicians aren't always aboard some submarines," he says, "so the corpsman becomes the only medical representative and is responsible for everyone's health and hygiene. When I'm the only medically trained crewmember, I serve as a department head and am responsible for providing medical advice to the skipper."

But HMCS Davis has been trained in more than health care. He also has completed three courses that most corpsmen never tackle: basic sonar analysis, identification and analysis of electronic countermeasures, and scuba diving. "When I volunteered for duty in the submarine service, I wanted to be the best," he explains. "And to be the best, I had to know all I could about submarine systems. So I attended schools related to submarine duty."

Tight squeeze. Aboard the *Grayback*, Navymen live in a unique physical and psychological atmosphere. Into the small space inside the *Grayback*'s hull are packed three diesel engines, two banks of storage batteries, eight torpedo tubes, fuel for the diesel engines, electronic computers, radar, sonar equipment, ventilation ducts, and miles of electrical cables. Somehow there is also room for bunks, seven commodes, three shower stalls, cooking equipment, enough food to last 60 days, and 88 crewmembers.



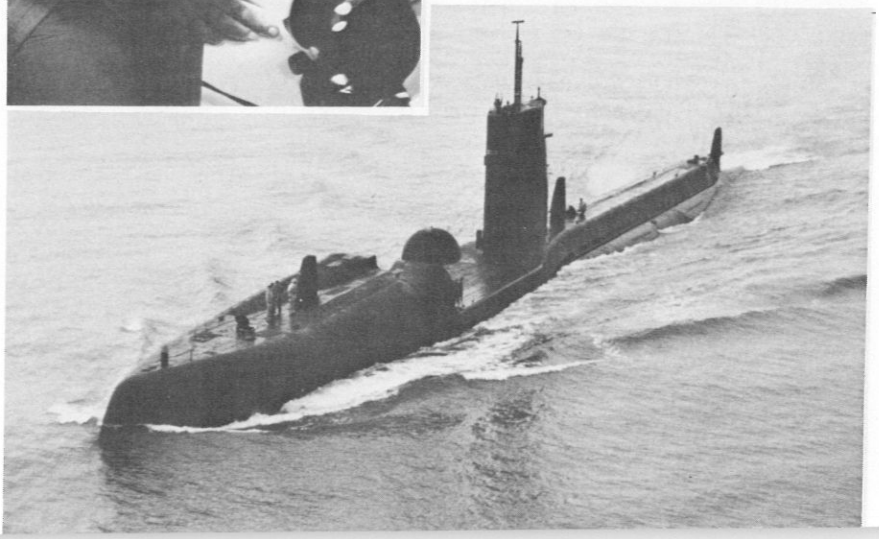
"I have all the space I need to conduct a sick call," HMCS Davis says—but it's a tight squeeze. The *Grayback* sickbay is a berthing compartment equipped with six bunks: there is barely enough room left over for two people to move comfortably. HMCS Davis uses one bunk as a desk.

Common to most submariners is their willingness to form close relationships with their shipmates. According to HMCS Davis, "Psychologists can often identify this trait in students who attend the eight-week training course for submariners at Naval Submarine Base New London. During that course students are tested for their physical and psychological suitability to submarine life."

"Submarine school teaches the basics of submarine duty," he explains. "You get into electrical circuits, air and ventilation systems, hydraulics, propulsion, weapons, damage control, first-aid, and steering and diving systems."

After initial training, the men are assigned to a submarine. But they do not win their dolphins—the insignia of the submarine service—immediately. Instead in their first nine months aboard, novice submariners learn as much as they can about submarine workings, and have a crack at every available job. They must demonstrate their ability to rig every compartment for diving, operate the controls for diving and surfacing, fire torpedoes, and operate all machinery.

HMCS Davis aboard the USS Grayback
"I won't let my shipmates down"



Trials. HMCS Davis' first trial aboard a submarine came one month after graduation. "It was the most memorable experience of my naval career," he recalls. "I had just reported on board the USS *Sabalo* and was the only person there with any medical training. We were crossing the equator bound for Australia when a crewmember suffered a heat stroke, and his respiration and heart stopped."

HMCS Davis remembers that he was afraid something would go wrong and he would not be able to revive the sailor. "The entire crew was watching me as I performed mouth-to-mouth resuscitation and pounded on the sailor's heart until his breathing was restored." With a broad grin, he says, "From that day until now I have been hearing, 'Doc Davis can do no wrong.' I try to live up to that reputation."

The submariner works hard to keep up with advances in submarines and medicine. "I want to know more than I am required to know," he says. "One thing is certain: I won't let my shipmates down."

Aboard the *Grayback*, HMCS Davis has had three especially trying experiences. In 1969, he helped salvage the sunken USS *Guitarro* off Mare Island Naval Shipyard in California. A year later, he saved the life of a sailor who suffered a cardiac arrest. And last year he helped rescue and treat three pilots from the Royal Thai Navy who were downed in the Gulf of Thailand.

Not everyone can become a submariner and learn to operate the vessel's complex machinery or adapt to life in confined spaces. But those who can master these challenges are authorized to wear the coveted twin dolphin insignia. HMCS Davis has his dolphins, a responsible job, and a reputation among his peers as the corpsman who can do no wrong.

—Story and photos by JOC Milt Harris, CINCPACFLT Public Affairs Office, Detachment Western Pacific, Box 88, FPO San Francisco 96651.

BUMED SITREP

RESEARCH LAB CLOSES . . . The Naval Medical Field Research Laboratory at Camp Lejeune, N.C., was disestablished 1 July 1976. The lab's functions will be carried out by other naval medical research activities, by contract, and by other DOD laboratories.

AUDIT TIPS . . . Medical Department activities should review these management areas:

- Navy medical treatment facilities must, in accordance with JAG Manual paragraphs 2403.A and 2403.C, report to the Office of the Judge Advocate General (JAG) the value of medical care given to any patient when a third party may be legally liable for causing the patient's injury or disease, or when the patient may file a claim under workmen's compensation or medical insurance. NAVJAG Forms 5890/12 should be submitted as soon as possible after a patient is admitted if it appears that inpatient care will exceed two days or that more than ten outpatient treatments will be furnished. Early notification will help JAG settle claims in the government's best interests.
- Navy Stock Fund accounting data should not be cited to procure materiel under blanket purchase agreements or imprest funds. End-use funds are used when the order and receipt of materiel will occur nearly simultaneously (30 days).
- Blanket purchase agreements should be reviewed periodically and updated to show changes in people authorized to place calls. Only Purchase Branch personnel may be authorized to place calls for purchases exceeding $500. No calls may be placed by unauthorized persons.

USUHS APPOINTMENTS . . . CAPT Stephen Barchet (MC), former head of the BUMED Education and Training Branch, has been named associate dean of the Uniformed Services University of the Health Sciences, and executive secretary to the USUHS Board of Regents. CAPT Donald M. Gragg (MC) will head the USUHS Section on Medical Education; he holds a Ph.D. in medical education and has directed the Curriculum Department, Naval Health Sciences Education and Training Command, since 1973. Acting chairman of the USUHS Department of Medicine will be CAPT Donald O. Castell (MC), former chief of medicine and director of the Clinical Investigation Program at National Naval Medical Center.

MILITARY RESIDENCIES BACKED . . . Military medicine won some crucial support when the American Medical Association House of Delegates approved a resolution supporting military graduate medical education at the AMA annual convention last June. In the resolution, the AMA expressed concern over reductions in military residency training programs, and agreed that the military should train its own physicians. The resolution was introduced in response to threatened cutbacks in military graduate medical education.

CONDUCT UNBECOMING . . . All Navy and Marine Corps military and civilian personnel must adhere to DOD standards of conduct. Members will not engage in criminal, infamous, dishonest, immoral, or disgraceful conduct. In particular, members must avoid any action which might result in or create the appearance of:

- using a government position for private gain.
- giving preferential treatment to any person.
- impeding government efficiency or economy.
- losing complete independence or impartiality.
- making a government decision outside official channels.
- adversely affecting the public's confidence in government integrity.

U.S. NAVY BIRTHDAY OCTOBER 13, 1976

Policy

Instructions and Directives

Occupational health services

Pending revision of chapters 15 and 26 of the *Manual of the Medical Department* and BUMED Instruction 6320.31, this notice gives interim guidance on providing occupational health services, including medical examinations and tests, job-related immunizations and chemoprophylaxis, education and training in occupational health, and emergency treatment of illnesses or injuries occurring at work. Such services shall be provided to military personnel, naval employees with U.S. Civil Service status, nonappropriated fund employees of the Navy, and civilian marine personnel of the Military Sealift Command. Emergency treatment of maladies occurring at work, and other legally specified occupational health services will be provided to volunteer workers, employees of organizations under federal contract, civilian employees of federal agencies other than the Navy, and foreign nationals employed by the Navy outside U.S. territorial jurisdiction.—BUMED Note 6260 of 2 June 1976.

Federal regulatory requirements for X-ray equipment

A new section on federal regulatory requirements for X-ray apparatus has been added to the *Medical Equipment Maintenance and Repair Manual.* Navy personnel who install and maintain X-ray equipment are subject to these regulations.—BUMED Instruction 6700.36, change transmittal 2 of 14 June 1976.

First-aid kits for aircraft and flight personnel

The Survival Escape and Evasion Kit (SEEK-2) is obsolete, and has been replaced by the Individual Aircrewman's Survival Kit (SRU-31/P).—BUMED Instruction 6780.1H, change transmittal 1 of 23 June 1976.

Privacy Act statement

DD Form 2005 (Privacy Act statement) has been revised to cover all requests for personal information needed to facilitate and document health care received at a Navy medical or dental facility. Commands should discontinue use of the old DD Form 2005 (1 Sept 1975 edition), but need not substitute the new form for a signed DD Form 2005 already in a patient's record.

On their first visit to a Navy medical treatment facility, patients should read and sign the new DD Form 2005. The original signed copy should go into the patient's record to cover all personal information subsequently used in care and treatment. The patient should keep a copy of the signed DD Form 2005. If the patient refuses to sign the statement, the denial should be noted in the record and treatment should be provided based only on available information. When the patient's records are not available, a new statement should be obtained and inserted in the new record.—BUMED Note 5211 of 25 June 1976.

Freedom of Information Act

In line with the Freedom of Information Act (FOIA), the Medical Department will make available to the public information concerning Medical Department operations, activities and administration. Records requested by the public will be provided if:

- the information is not exempt from the provisions of the FOIA.
- the requester complies with minimum requirements of SECNAV Instruction 5720.42B.
- the privacy of health care records is not violated.

Commanding officers and officers in charge of Medical Department activities should review SECNAV Instruction 5720.42B on availability to the public of Navy records. That instruction's major requirements are:

- Members of the public shall be advised of the correct way to ask to examine records or to obtain copies of such records.
- Requests for records or information shall be answered within ten working days after the request is received.

When requests cannot be processed within time limits or must be denied, commands shall prepare for BUMED Code 00 signature a letter to the requester citing the reasons for the denial and the process by which the requester can appeal. This letter, the original request, and a copy of the documents requested shall be sent immediately to BUMED Code 00 in an envelope clearly marked "FREEDOM OF INFORMATION."

While commanding officers are authorized to furnish information and copies of records, and to make records available for examination, only the Surgeon General is authorized to deny requests.

Commanding officers shall develop internal procedures for handling Freedom of Information requests, and establish controls to ensure that such requests are

processed within time limits. They shall ensure that fees for locating and copying records are collected and deposited properly, and that personnel working on Freedom of Information requests know the provisions of the pertinent instructions.

Quarterly reports are required on the cost of filling Freedom of Information requests. The first report is due for the quarter ending 30 Sept 1976, and shall be submitted to BUMED Code 0010 by 12 Oct 1976. Annual reports on the effectiveness of command procedures for answering Freedom of Information requests must be forwarded to BUMED Code 0010 by 20 December each year.—BUMED Instruction 5720.8 of 6 July 1976.

Joint utilization of Armed Forces medical laboratories

This instruction updates the addresses of Navy, Army and Air Force medical laboratories, describes the type of services available, and outlines procedures for using them.—BUMED Instruction 6200.1E of 12 July 1976.

Armed Forces Institute of Pathology

The Armed Forces Institute of Pathology (AFIP) shall receive and accept gifts and donations in accordance with Army Regulation 1-100, especially items, materials and medical artifacts which may have scientific, historical or archival significance.

AFIP shall maintain a consultation and monitoring service to assist the Department of Defense in resolving civil or criminal medical-legal cases, and to help other federal agencies resolve such cases in line with policies on interagency support. This service will not detract from the authority and responsibility of Armed Services judge advocates general to adjudicate and resolve medical-legal cases and to maintain liaison with the Department of Justice.—BUMED Instruction 6510.2D, change transmittal 1 of 19 July 1976.

Surveying microwave ovens for hazards

Microwave ovens at all activities shall be inspected when they are installed; after maintenance, overhaul or repairs; and quarterly, or more often if required. In the visual inspection these items should be noted:

- doors hanging askew.
- missing or loose screws and hinges.
- condition of door seals and windows.
- general sanitation, especially grease on door seals or inside oven.
- method for preventing unauthorized people from using the oven.
- at least two feet between ovens.

In the second part of the inspection, monitoring radiation leakage, a load must be used: operating a microwave oven without a load can damage the oven. If the oven operates when its door is open, the interlocks must be repaired. The inspector should move a probe slowly enough to observe changes in the field, indicating localized high-field areas, and should concentrate on the most likely leakage points, such as door frames and seals, seams in the cabinet, and viewing windows and seals. Leakage must never exceed 5 milliwatts/centimeter^2 at any point 5 centimeters or further from the external surface of the oven. Ovens with leakage greater than 2 milliwatts/centimeter^2 must be reinspected one month later to determine if leakage is increasing. Results of previous inspections should be consulted to note any large increase in leakage. If the leakage is more than prescribed limits, the oven shall be removed from service, repaired, and returned to service only when it passes a visual and leakage inspection.—BUMED Instruction 6470.16 of 15 July 1976.

Safety inspection service

Safety management students from Indiana State University can perform safety inspections and give safety advice at Medical Department activities. The students can recommend improvements based on safety standards and codes covering subjects such as hospital emergency preparedness, flammable and combustible liquids, electricity in patient care facilities and inhalation anesthetics. Activities must fund the cost of this service through command resources. Expenses vary depending on the cost of transportation, room, and board for the students. A fee of $1,200 is charged to cover university fees and the salaries of the safety management professor and students. For more information, contact Dr. J.V. Adams, Safety Management, Department of Health and Safety, Indiana State University, Terre Haute, Ind. 47809; or call (Area code 812) 232-6311, extension 2473.—BUMED Notice 5100 of 26 July 1976.

Service obligation for dental officer training

Two revisions have been made in the previous instruction on this subject (BUMED Instruction 1520.18A of 2 June 1976):

- Any service obligation a dental officer incurs while in Navy residency or similar training is in addition to the obligation incurred by participating in a Navy dental scholarship program. This additional obligation must be served after the training is completed and after the scholarship-related obligation is fulfilled.
- Students in the Armed Forces Health Professions Scholarship Program do not incur an additional service obligation for an initial general practice residency in dentistry, or for residency training they received before they satisfy an active-duty obligation incurred under the scholarship program. However, time spent in an initial military general practice residency in dentistry or in residency training is not creditable for satisfying an active-duty obligation imposed under the scholarship program.—BUMED Instruction 1520.18B, 28 Jul 1976.

Features

Managing Child Abuse: A Multidisciplinary Approach for Naval Hospitals

LCDR Thomas Brewster, MC, USNR
LCDR Kenneth L. Postel, MSC, USN

Every day in the United States at least two children are killed by physical abuse. That startling report (*American Medical News*, 21 April 1975) supports the findings of Helfer and Kempe (*1*):

The incidence of child abuse in this country is approximately ten per thousand live births per year. Approximately ten percent of injuries seen in hospital emergency rooms in children under five years of age have been inflicted by someone. Child abuse may be a greater killer of children between six and twelve months than any cancer, malformation, or infectious disease. From one month to six months of age, it is second only to sudden infant death syndrome. After one year of age, it is second only to true accidents.

There are many excellent articles on the problems and management of child abuse (*2,3,4*). Unfortunately, while the problem is widely recognized, there is a desperate lack of workable programs to help children who are abused, or to counsel their parents (*5,6*).

We hope that the program we developed at Naval Regional Medical Center, Camp Lejeune, N.C., can serve as a model for child advocacy programs in other naval hospitals.

CHILD ABUSE/NEGLECT COMMITTEE

Our program began unofficially some four years ago when we established in the Department of Pediatrics a file containing the names of children suspected of being abused or neglected. The attending physician referred these names to the Department of Social Services of Onslow County, N.C., but the medical center took no further action.

Two years ago the chief of pediatrics at NRMC Camp Lejeune began meeting every two weeks with a psychiatrist, a social worker from the Onslow County Department of Social Services, and Navy Relief Society nurses to evaluate and act on cases of child abuse. By 1974 it was apparent that there were too many cases to process at informal meetings, and the NRMC Child Abuse/Neglect Committee was established. The committee consists of a pediatrician, psychiatrist, administrator, attorney, and representatives of the Onslow County Department of Social Services, the Onslow County Mental Health Clinic, the Navy Relief Society, and the medical center's American Red Cross unit.

Each committee member has an important role to play in protecting abused and neglected children:

- The pediatrician alerts the committee to cases of child abuse, provides follow-up medical care and counseling, and coordinates the management of such cases.
- The psychiatrist counsels and evaluates family members to determine the reasons for the abuse.
- The administrator develops lines of communication between the committee and military chaplains, the base housing office, military units, and other groups or agencies. He also sees that child abuse data and the proceedings of committee meetings are recorded.
- The attorney provides legal counsel to the medical center and acts as a liaison with the local legal community. He initiates legal action when appropriate.
- Social Services caseworkers follow cases that fall under the jurisdiction of the State of North Carolina, and take legal action, when required, through the State.
- Members of the Onslow County Mental Health Clinic counsel families referred by the committee or by agencies working with the committee.
- Members of the American Red Cross unit sponsor family group therapy sessions and counseling.
- The Navy Relief Society sponsors registered nurses to counsel families at home, and provides financial assistance.

Our Child Abuse/Neglect Committee meets once a week to discuss new cases: how the case was discovered, what abuse occurred, the degree of injury,

LCDR Brewster, formerly on the staff of the Pediatric Service, Naval Regional Medical Center, Camp Lejeune, N.C., has been associated with The Children's Hospital Medical Center, Boston, Mass. 02115 since his release from active duty. LCDR Postel is chief of the Patient Affairs Service, NRMC Camp Lejeune, N.C. 28542.

TABLE I. Child Abuse and Neglect Cases at NRMC Camp Lejeune—August 1974–May 1975

Month	New Cases Per Month	
August 1974	4	
September 1974	8	
October 1974	10	
November 1974	12	
December 1974	3	
January 1975	10	
February 1975	4	
March 1975	4	
April 1975	7	
May 1975	4	
Total	66	
Active cases, Aug 1974–May 1975		49
Inactive cases, Aug 1974–May 1975		53
Total		102
Cases involving abuse		73
Cases involving neglect		27
Cases involving abuse and neglect		2
Total		102
Deaths		2
Cases in which abuse was repeated		4
Children placed in foster care		8

TABLE II. Rank of Abuser

Rank or Status of Abuser	Number of Cases
PVT	5
PFC	9
LCPL	5
CPL	7
SGT	12
SSGT	5
GYSGT	2
HN	2
HM1	1
LT	2
MAJ	1
CWO	2
Retired	1
Other	41
Total	95*

*Abusers were counted only once, even if they abused more than one child, or abused the same child twice. Therefore, this total is lower than the actual number of cases (102) shown in Table I.

TABLE III. Sex of Abuser

Sex of Abuser	Number of Cases
Male	52
Female	33
Both	17
Total	102

treatment rendered, and disposition of the case. Follow-up actions—further medical care, psychiatric evaluation of family members, caseworker visits to the family or other supportive measures—are recommended. A date is set to review each case and determine what further action may be required; these follow-up reviews are conducted periodically, and committee members may request a review before the scheduled review date. During the reviews, care given the patient and family members is evaluated, and a plan of action is developed to close the case.

A file is opened for each new case, and the incident that brought the case to the attention of the committee is recorded, along with the parents' names, social security numbers, military unit and telephone number. These files are protected in compliance with Privacy Act regulations. An information sheet and cross-index card are sent to our Data Processing Unit, where the roster of child abuse cases is kept up to date.

In some cases, it is necessary to contact the abuser's unit commander to ensure that the individual will report for counseling; sometimes the assistance of our base inspector's office is necessary to gain the individual's cooperation. On the whole, however, the counseling sessions have been well accepted by parents, as shown by the large number of couples now attending or awaiting new groups or vacancies in existing groups.

Six to seven new cases of abuse or neglect are reported each month to our committee, with about two cases of abuse reported for each case of neglect. Tables I, II, and III show data accumulated from August 1974 to May 1975. Of two cases that resulted in a child's death, one may have been a crib death, but neglect was suspected to be a contributing cause. In the second case, a 15-month-old child sustained an arm fracture under suspicious circumstances. Cursory home and family evaluations were unrevealing. But three months later, the child was dead on arrival at the emergency room, where the attending physician found evidence of severe head trauma apparently inflicted over several days. Because this case occurred while the committee was being formed, the parents had not been evaluated by a psychiatrist, and the neighbors had not been questioned—actions that might have saved the child's life. We hope our committee's improved investigative system will prevent further tragedies such as this case.

As more data is accumulated, we can better interpret the causes of maltreatment of children at Camp Lejeune. We do know that most cases involve enlisted men; other frequently associated factors are parental immaturity, alcoholism, low family income, and crowd-

ing in the home. Although nationwide statistical data show that the majority of child abusers are females, in our study the majority of the abusers were males.

CASE REPORTS

Three examples illustrate our committee's method of managing child abuse:

Case 1. Two siblings, BJO (17 months) and RMO (6 months), were admitted to NRMC Camp Lejeune on 24 May 1974. After their release on 14 June, the children were placed in temporary foster homes several times because they were constantly abused, even though their parents were counseled by psychiatrists, chaplains, our patient affairs officer, Navy Relief Society nurses, Department of Social Services caseworkers, and Mental Health Clinic workers. The children were readmitted to the medical center on 13 Feb 1975 for injuries possibly caused by abuse. After their release on 20 March, the children were taken from their parents by the Onslow County Department of Social Services and placed in permanent foster homes.

Case 2. BB, now 1 year, was admitted to NRMC Camp Lejeune at age 2½ weeks with a fractured humerus, clavicle, femur, and skull, and multiple contusions; he was hospitalized for 55 days. The Onslow County Department of Social Services asked the State of Ohio to award custody of this child to his paternal grandparents, who live in Ohio, and he was discharged to their care. A sibling remained in the parents' home. The mother was treated at the Mental Health Clinic, and no further child abuse or neglect was noted. The father later was discharged from the Marine Corps and moved with his wife to Ohio. The Ohio probation court which had placed BB in his grandparents' care required the mother to continue supporting and visiting BB.

Case 3. SEC, aged 7 months, required hospitalization after being beaten by his father. The child was placed in temporary foster care by the Onslow County Department of Social Services, and after much encouragement from a psychiatrist, the parents agreed to attend group therapy. Our committee worked with the base housing office to find on-base quarters for the family; in this more convenient location, the parents were able to attend and benefit from counseling. Since the child's return to his home, Navy Relief Society nurses have visited the family and report that everything seems to be under control; the nurses will continue monthly visits.

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Notes & Announcements

DENTAL MEETINGS SET FOR NOVEMBER

The Annual Dental Corps Reception is scheduled for 14 Nov 1976, from 1800 to 2000, at the Las Vegas (Nev.) Hilton Hotel. This reception will be held in conjunction with the 112th annual meeting of the American Dental Association.

The Las Vegas Hilton is also the site of the Annual Reserve Symposium, set for 15 Nov 1976 at 1330. This symposium is open to Reserve and Regular dental officers. Featured speakers will include VADM Pierre N. Charbonnet, USN, chief of Naval Reserve, and RADM Robert W. Elliott, Jr. (DC), chief of the Dental Division, Bureau of Medicine and Surgery. This year's symposium theme is "The Naval Reserve—Co-Partner in Today's Total Force."

NAMRU-3 LIBRARY . . . Construction of a new medical library (see inset) for the U.S. Naval Medical Research Unit No. 3 got under way in Cairo with groundbreaking ceremonies last August. Digging in above are: (left to right) CAPT Walter F. Miner (MC), NAMRU-3 commanding officer; Honorable Hermann Eilts, U.S. ambassador to the Arab Republic of Egypt; and Dr. Fawzi El Sayed, first undersecretary, Ministry of Health, Arab Republic of Egypt. The library will be used by the NAMRU-3 staff and by Egyptian physicians, scientists, and students.

DENTAL CONTINUING EDUCATION COURSES SET FOR DECEMBER

The following dental continuing education courses will be offered in December 1976:

National Naval Dental Center, Bethesda, Md.
Endodontics 6-8 Dec 1976

Eleventh Naval District, San Diego, Calif.
Occlusion 6-8 Dec 1976

U.S. Army Institute of Dental Research, Walter Reed Army Medical Center, Washington, D.C.
Endodontics 6-9 Dec 1976

Letterman Army Medical Center, San Francisco, Calif.
Current Concepts in
Restorative Dentistry 6-9 Dec 1976

Requests for courses administered by the Commandant, Eleventh Naval District, should be submitted to: Commandant, Eleventh Naval District (Code 37), San Diego, Calif. Applications for other dental continuing education courses should be submitted to: Commanding Officer, Naval Health Sciences Education and Training Command (Code 5), National Naval Medical Center, Bethesda, Md. 20014. Applications should arrive six weeks before the course begins.

Cross-country travel for dental continuing education courses and professional conferences generally will not be approved because of funding limitations. Similarly, travel from outside CONUS generally will not be approved.—BUMED Code 6.

ACADEMY OF GENERAL DENTISTRY MAY GRANT FELLOWSHIP CREDIT

The Academy of General Dentistry has in the past given favorable consideration towards Fellowship status for hours spent in Navy postdoctoral fellowship programs. Dental officers who have completed such programs and are working towards Fellowship status may ascertain whether their program meets the necessary criteria by writing to: Academy of General Dentistry, 211 E. Chicago Ave., Suite 1244, Chicago, Ill. 60611.

DENTAL STATE BOARD EXAMINATIONS

Reporting dates for newly commissioned dental officers sometimes preclude their taking dental state board examinations for licensure before reporting for active duty. Dental officers who do not have a state license and who wish to take state board examinations after they report for active duty may be issued authorization orders in accordance with BUMEDINST 1500.4 series; this action is contingent upon their commanding officer's approval, so long as such approval does not adversely impact upon the mission of the command and upon operational readiness.

Dental officers who already have a state license, or who previously have been granted authorization orders in order to take a state board examination, should take annual leave for further board examinations.—BUMED Code 6.

1977 WHITE HOUSE FELLOWS PROGRAM ANNOUNCED

Applications are now being accepted for the 1977 White House Fellows Program, in which 15 to 20 outstanding men and women will serve as special assistants to the vice-president of the United States, White House staff members, cabinet members, and other top federal officials. Candidates must be U.S. citizens between ages 23 and 36. Applications are available from the President's Commission on White House Fellowships, 1900 E St. N.W., Washington, D.C. 20415, and must be postmarked by 26 Nov 1976. Military personnel chosen for the program remain in active-duty status and receive full pay and allowances.

FAMILY PRACTICE PHYSICIANS . . . Six medical officers completed family practice residency at NRMC Charleston last June and were honored in the medical center's second annual family practice resident graduation ceremony. The new family practice physicians are: (left to right, back row) CDR G.J. Nowak, LCDR T.A. Gay, LCDR D.C. Richmond, LCDR G.J. Harper. (Seated) LT P.P. Hall, LCDR A.L. Hall.

Enlisted Scene

TRANSFERRING OR RETIRING?

If you will transfer or retire soon, be sure to read Naval Supply Publication 380, "It's Your Move," with the supplements "Privately Owned Vehicles" and "Mobile Homes." Copies of these publications, which were revised in June 1976, are available from any personal property office.

UNAUTHORIZED ABSENCE CAN COST PLENTY

UA (unauthorized absence), AOL (absent over liberty), and AWOL (absent without leave) all mean the same thing when it comes to money. Many Navy members believe that the amount of pay they forfeit because of an unauthorized absence is based on "take home" pay. Not true! The amount of pay you forfeit is based upon your gross monthly income.

For example, let's look at the case of HN Fred Freeloader, who has more than two years' service for pay purposes. He is married, and draws a $200 per month dependency allotment payable to his wife. For reasons known only to himself, HN Freeloader goes on unauthorized absence for ten days. Upon his return, Freeloader calculates that he owes the U.S. Government $105 for his ten days' absence. Imagine his surprise and confusion when his pay is checked $254.57. Why so much? First, because the penalty is based on his gross monthly income, and second, because his $200 dependency allotment remained in force even though he was not in a pay status while absent.

HN Freeloader also loses one day of annual leave for his ten days' unauthorized absence. His entry base date for pay purposes and the expiration date of his active obligated service are advanced ten days; as a result, his longevity increases will come ten days later than before he skipped town, and he will serve on active duty ten days longer. He also loses whatever forfeiture his commanding officer surely will award at captain's mast—perhaps as much as the top penalty of $220.65.

The commanding officer could, and probably would, withdraw HN Freeloader's recommendation for E-4. The hapless corpsman would then stay E-3 at least another six months before he could take the examination for advancement. The difference between E-3 and E-4 in basic pay and allowances: $36.30 per month. Multiply $36.30 by the six months he will have to wait for advancement, and it adds up to another $217.80 forfeited.

If HN Freeloader receives all these monetary penalties, his ten days of unauthorized absence would cost him a whopping $693.01.

The longer a member remains away from his or her unit in an unauthorized absence status, the more complicated and expensive are the consequences. Don't vanish without permission! Seek guidance from your leaders when you have a problem that requires you to spend time away from your command. Your supervisors will help you find a solution you can afford.

NEW WAY TO RECORD ACCOLADES

All hands should read Bureau of Naval Personnel (BUPERS) Notice 1070 of 6 Aug 1976, which revises the procedure for recording commendatory correspondence in the records of enlisted Navy members. The new procedure became effective on 1 September.

The major changes are:

- After 1 Sept 1976, BUPERS will not accept copies of commendatory correspondence for filing in the enlisted service jacket maintained at BUPERS.
- Reporting seniors should consider commendatory correspondence when they evaluate a member's overall performance, and comment on this correspondence when preparing formal performance evaluations.
- Members being evaluated will be given the opportunity to submit to their reporting senior information they believe should be mentioned in the evaluation report. A standard form is being developed for this purpose; until it is available, the current evaluation worksheet should be used.

With commendations now a permanent part of the evaluation report, these reports have increased importance and value. Be sure to review your evaluation to ensure that your reporting senior has not overlooked any significant accomplishments you have achieved or recognition you have earned during the reporting period.

PROCEED TIME POLICY REVISED

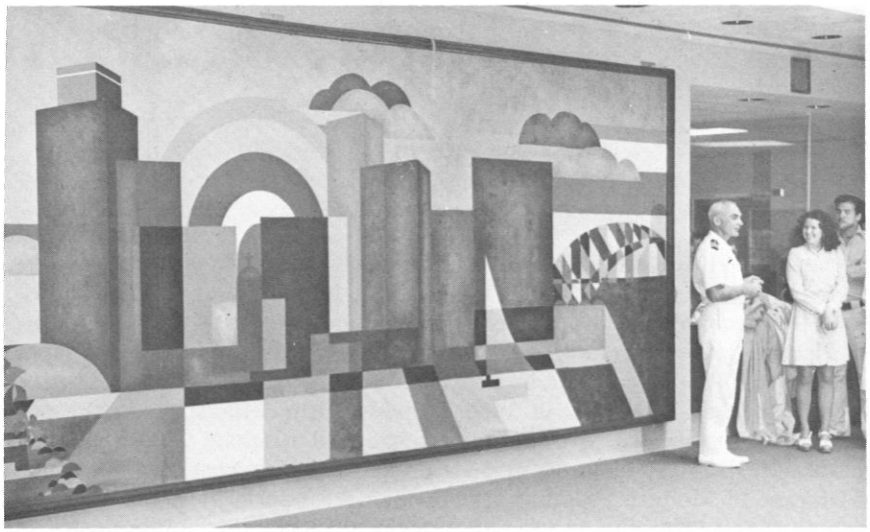
BUPERS Notice 4650 of 27 July 1976 advises that, effective 1 Oct 1976, proceed time will be authorized *only* for eligible personnel executing permanent change of station orders to or from:

- a ship or mobile unit with a sea/shore code other than 1.
- an overseas assignment (including Alaska and Hawaii).

—HMCM Horace S. Anderson, Master Chief Petty Officer of the Force, Bureau of Medicine and Surgery, Code 006.

NAVMED Newsmakers

Patients at NRMC Corpus Christi don't have to go outdoors to see the city skyline—it's recreated in a mural on a waiting room wall. The 25-foot-long abstract is a bicentennial gift from Carroll High School art students to the medical center, whose commanding officer, CAPT **John Lukas** (MC), confidently told them to choose any theme they thought appropriate. The names of the mural's designer, art student Kathy Ryan, and the 11 other students who worked more than seven months on the project are listed on a nearby plaque.



CAPT Lukas and mural: Gift

It was "Wagons, Ho!" for LTJG **Dorene Dahlgren** (NC) of NRMC San Diego when she changed into pioneer garb and set out on a North Dakota trail in a covered wagon. LTJG Dahlgren joined her parents, three brothers, four sisters, and some 300 other adventurers on the westward trek, following the route that early settlers took from Jamestown, N.D. to Mandan, N.D. When the wagons rolled into Mandan after eight days, the travelers rejoiced at their return to the 20th century—and not just because they missed cheeseburgers and television. Says LTJG Dahlgren, "We were all so excited about taking a bath!"

For HMC **Albert L. Lathrop**, it should have been a routine inspection of the NRMC San Diego dining hall. But suddenly there was a commotion on one side of the dining area: a petty officer was lying on the floor apparently in an epileptic seizure. Quickly realizing that the man's appearance and inability to breathe indicated he was choking, Chief Lathrop lifted the man to his feet, held him from behind, and using the Heimlich maneuver, pushed in and up on the victim's abdomen just below the rib cage until the obstruction was ejected. To impressed bystanders—and to the man whose life was saved—the procedure is now known as Lathrop's maneuver.

Making a splash is HM3 **Tom Kempf**, a top Navy swimmer for the past two years. At the Navy West Coast Swimming and Diving Championships last June, he won the six individual events he entered, and led the 11th Naval District to a team championship.

CDR Hirschfeld and hosts: Greetings

The Borough of Gosport, England, wanted to honor 25 U.S. Navy exchange personnel serving with the Royal Navy in the Portsmouth, Hampshire area—and what better time than July, America's bicentennial month. With the U.S. flag waving atop the town hall, some of Gosport's 82,500 citizens turned up for a gala reception and a display of English style hospitality. CDR **William E. Hirschfeld** (DC), senior dental surgeon aboard HMS *Ark Royal*, accepted bicentennial greetings from the town mayor.

"I sure would like to play on an Olympic team if I'm good enough," says HN **Cheryl Shanklin** of NRMC San Diego. Time and talent are on the side of the 19-year-old volleyball ace. One of 12 women representing the Navy at the recent interservice women's volleyball tournament, HN Shanklin played so impressively that she was picked for the Armed Forces women's volleyball team at the 1976 American Athletic Union championships. With a record like that, this Navy athlete might well have an Olympics in her future.

Soundings

Trauma: The Neglected Disease

Joseph T. Mullen, M.D.

Trauma—illogical, disorderly, caused by violence and violent in its effect—is probably the worst-treated disease in modern society. A publication on trauma issued by the National Research Council in 1966 was aptly entitled "Accidental Death and Disability—The Neglected Disease of Modern Society" (*1*). I submit that it is apathy on the part of the medical profession and the public that has made trauma a neglected disease.

Hippocrates' statement that "war is the only proper school for surgeons" has been true for more than 2,000 years: the history of trauma surgery is the history of war. However, in the interbellum periods we seem to forget quickly the lessons we learn in war, even though injuries sustained in peacetime are equal in magnitude, if not in number.

Because burns, broken bones, bloodied bodies and death are hardly spirit lifting, there is a natural aversion to trauma. Medical students and many residents gain little experience in managing trauma victims because the medical profession has been reluctant to pursue the management of this disease.

Some of the lack of interest in trauma stems from greater interest in other medical problems. Public interest has been captured by the establishment of federal commissions and programs to attack heart disease, stroke, and cancer, and by widely publicized campaigns against birth defects, cystic fibrosis, sickle cell disease, and a host of other rare diseases. But few such concerted efforts have been undertaken to make the public aware of the trauma problem. As a result, during the past few years, funds allotted by the federal budget to study these diseases have averaged $220 for each cancer patient, $74 for each cardiovascular patient, and only 24 cents for each trauma victim.

While heart disease, stroke and cancer are the three leading causes of death in this country, trauma—the fourth most common cause—has far greater socioeconomic impact. Traumatic injuries require costly hospital care and rehabilitation, and the victims lose countless productive years. Trauma is also the leading cause of death and disability between the ages of 1 and 37 years, accounting for 50% of deaths in that age group.

In 1969, in the U.S., there were 116,000 deaths from accidents, costing $23.5 billion. In the same year, there were 23,000 suicides, 14,500 murders, two million injuries from accidents involving moving vehicles, and 56,450 deaths. One in eight hospital beds in the U.S. was occupied by the injured.

In 1972, the toll of trauma was higher: there were 117,000 accidental deaths in the U.S., costing $32 billion, and 18,529 murders, 54% caused by handguns (*2*). Also in 1972, accidents involving vehicles—the main killer of people aged 16 to 25 years—caused 2.5 million injuries and 56,300 deaths.

Approximately 2.3 million industrial or on-the-job injuries causing 14,200 deaths were reported in 1972, with injury to the hand—the extremity with which most of us make our living—the most common.

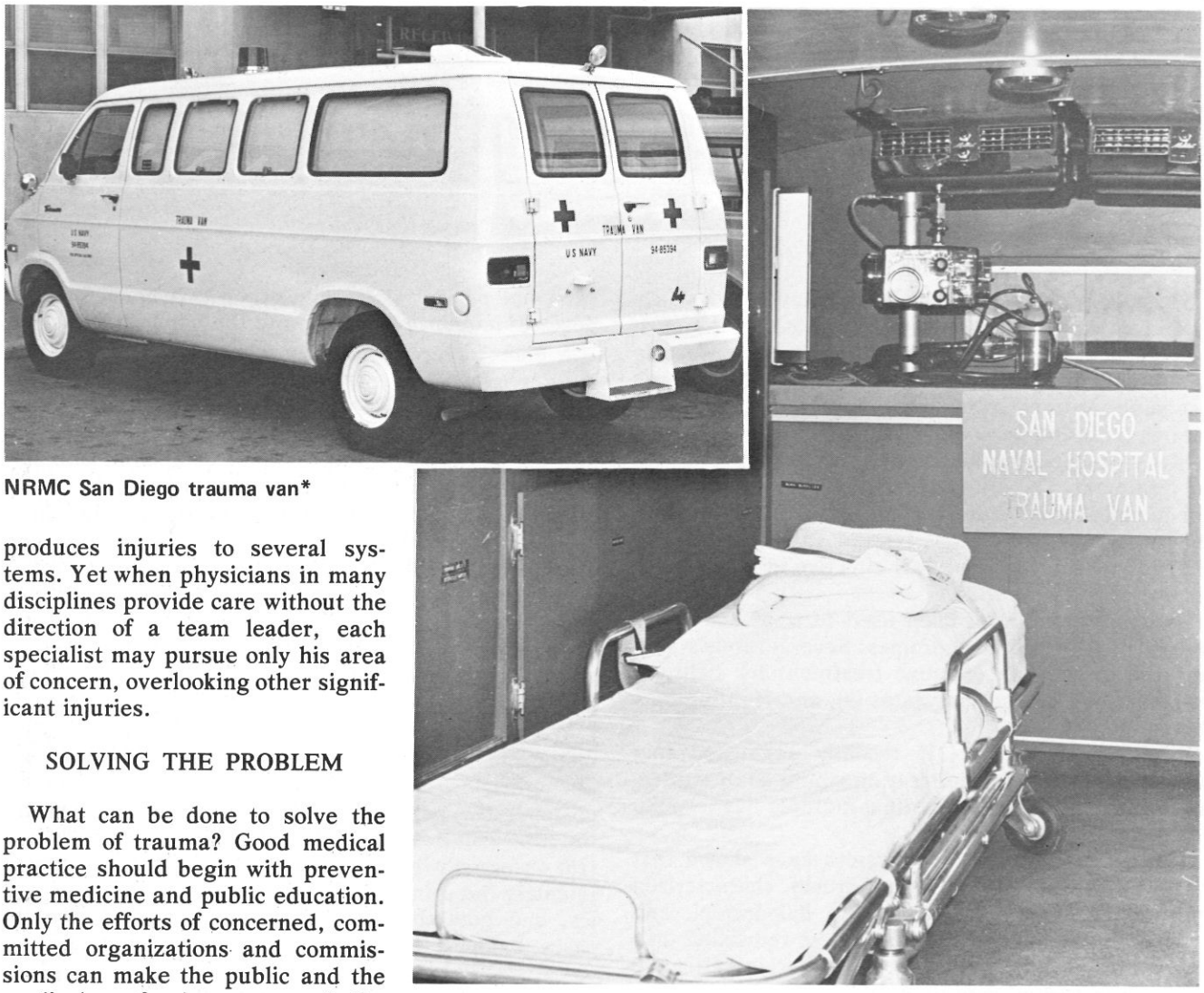
In 1975, more than 100,000 serious injuries were reported among children aged 1 to 16 years; 14% of these children died from their injuries. In fact, 40% of childhood deaths are due to trauma, with most of these fatal injuries occurring among children aged 6 to 10 years.

The automobile is the major instrument of trauma for children, as it is for adults, but in a different way: 40% of victimized children are struck as pedestrians rather than injured as occupants of the automobile.

The gap between what *can* be done and what *is* being done is wider in the treatment of trauma than in any other disease. What *can* be done is shown by the excellent record of the Armed Forces in Vietnam; yet today, too many deaths occur from injuries that could have been remedied. This failing is due mainly to our failure to provide rapid transportation to hospitals, and to the inaccessibility of hospitals and trained medical personnel—especially in rural areas, where 70% of deaths from vehicular accidents occur.

Even in well-equipped and well-staffed hospitals, competence is sometimes poorly applied. For example, blunt trauma sustained in high-speed auto accidents usually

This paper was presented to the Uniformed Services Pediatric Seminar, Norfolk, Va., on 16 March 1976. At that time, CAPT Mullen was chairman of the Department of Surgery, Naval Regional Medical Center, Portsmouth, Va. Dr. Mullen is now director of surgery at DePaul Hospital, Norfolk, Va. 23505, and professor of surgery at Eastern Virginia Medical School, Norfolk.



NRMC San Diego trauma van*

produces injuries to several systems. Yet when physicians in many disciplines provide care without the direction of a team leader, each specialist may pursue only his area of concern, overlooking other significant injuries.

SOLVING THE PROBLEM

What can be done to solve the problem of trauma? Good medical practice should begin with preventive medicine and public education. Only the efforts of concerned, committed organizations and commissions can make the public and the medical profession aware of the problem. And only after we are aware will we seek the means to prevent accidents by requiring safety features in cars, in factories, and at home. A device as simple as a seatbelt is considered the single most effective safety device for protecting automobile occupants, yet use of seatbelts is not mandatory!

Before a patient can be saved, his life must be sustained at the accident site and he must be transported quickly to the hospital. Certainly a nation whose technology can put men in space should be able to support emergency care and emergency transportation programs. Twenty-six states now have legislation regulating ambulance service; 44 states have adopted guidelines for training ambulance personnel. A new national registry of emergency technicians is passing through a painful youth, but is growing.

More and more hospitals are maintaining adequately equipped emergency departments that are open 24 hours. Journals are now devoted solely to trauma, and societies like the American College of Emergency Physicians have been established. Emergency department physicians and traumatologists are becoming more numerous, and emergency equipment more sophisticated. These are encouraging signs. But we as health care professionals must become more involved in the planning and practice of emergency medicine. We must play a major role, for if we do not, nonmedical planners who are eager but often uninformed will assume the task. Trauma is a disease we can no longer neglect.

*For a report on the NRMC San Diego Trauma Center, see "The Navy's First Trauma Center," *U.S. Navy Medicine*, 61(2):29-33, Feb 1973.

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Clinical Notes

The Analgesic Properties of Haloperidol

CDR Jesse O. Cavenar, Jr., MC, USNR
Allan A. Maltbie, M.D.

Since its introduction in the United States in the early 1960's, haloperidol (Haldol) has been one of the most widely used psychotropic drugs. Useful for treating acute and chronic schizophrenic disorders, the drug is also superior to chlorpromazine for controlling hallucinations (*1,2*) and paranoid symptoms (*3*).

Many psychoneurotic disorders respond to haloperidol treatment. The drug has been reported to be superior to chlordiazepoxide (Librium) for controlling anxiety and neurotic conditions (*4*) and anxiety states (*5*); O'Regan (*6*) found haloperidol effective in treating obsessive-compulsive states.

Haloperidol has also been used to treat acute and chronic organic brain syndromes. Several reports suggest the drug is an effective treatment for delirium tremens (*7,8*), confusional states (*9*), and Huntington's chorea (*10,11*).

Rosenberger, et al. (*12*) recently suggested that haloperidol is effective in treating young adult stutterers. Moldofsky (*13*) suggests that multiple tics respond to haloperidol treatment.

At least 20 different investigators have shown that the rare Gilles de la Tourette syndrome, characterized by coprolalia and tics, responds to haloperidol, and Cavenar, et al. (*14*) reported complete remission of a severe case of Gilles de la Tourette syndrome after the patient was treated with the drug.

Many clinicians consider haloperidol the drug of choice for the excited, aggressive, manic patient. Angyal (*15*), for example, believes that haloperidol is superior to any other form of treatment for the manic phase of manic-depressive psychosis. Other recent reports (*16*) indicate that haloperidol may be useful in withdrawing patients from heroin and other narcotics.

We recently reported another clinical use of the drug (*17*): in therapeutic dosages, haloperidol is a potent analgesic agent. Our report described the treatment of four patients with carcinoma: two obtained pain relief from haloperidol alone; the other two needed small doses of narcotics in addition to the haloperidol.

A potent neuroleptic and antipsychotic drug of the butyrophenone group, haloperidol was synthesized during a study of synthetic narcotic agents. According to Janssen, et al. (*18*), compounds similar to meperidine (Demerol) were studied, and a compound with analgesic properties like morphine and neuroleptic properties like chlorpromazine was synthesized. From this, a second compound was synthesized: it retained the chlorpromazine-like properties, but lacked the narcotic properties. This compound was floro-substituted to yield haloperidol. (Two other drugs of the butyrophenone group—dihydrobenzperidol and fluonisone—are effective general anesthetic agents but lack neuroleptic properties.)

We believe that haloperidol can be used like promethazine hydrochloride (Phenergan—a drug of the phenothiazine class) to increase narcotic effects in postoperative patients and in other pain syndromes. In the two cases described below, we used the effect Ban (*19*) observed when he reported that haloperidol "may intensify the primary effect of anesthetics and narcotics, and potentiate the effects of alcohol." In both cases, haloperidol produced dramatic relief of pain.

CASE REPORTS

Case 1. This 58-year-old white male was admitted to the Rheumatology Service because of a debilitated physical condition and the acute onset of wrist pain. His past history revealed 50 previous hospital admissions for rheumatoid arthritis. The patient had severe deforming arthritis, rheumatoid lung disease, and chronic anemia. He had undergone a pericardial stripping for pericarditis several years earlier.

The physical examination on admission revealed marked limitation of motion in all joints, and effusions of the wrist and knees.

Psychiatric consultation was obtained, since the activities of this once-active patient were now very restricted. The mental status examination revealed no evidence of psychosis, depression or organic brain syndrome. The patient was angry about the suffering he was forced to endure.

Morphine sulfate, 4 mg every four hours, did not relieve the patient's severe pain. Haloperidol was instituted at 4 mg daily; the dosage was gradually increased until, at 10 mg daily, he experienced marked relief of arthritic pain. The patient's narcotics were then stopped, and his pain was controlled with haloperidol and aspirin.

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The opinions expressed in this paper are those of the authors and not those of the Veterans Administration.

Case 2. This 25-year-old single student was in excellent health until August 1975 when he experienced severe pain in the left side of the neck and the left shoulder, with radiation into the left arm. The pain was episodic, and not related to physical activity. Two weeks after the onset of the pain, the patient developed point tenderness of the neck and shoulder muscles. The pain and muscle tenderness progressed to involve both shoulders and arms, with muscle weakness and wasting that was located more proximally than distally. The patient entered a community hospital in October 1975. A cervical myelogram was reported as negative, and he was started on steroids. No improvement was noted. He was referred to the Veterans Administration hospital in November 1975.

At the time of the patient's admission to the VA hospital, electromyogram studies were consistent with denervation, and a diagnosis of Parsonage-Turner syndrome was made. The patient had severe pain requiring Dilaudid, 2 mg every four hours, and sporadic intramuscular Demerol. On psychiatric consultation, the patient was found to be depressed secondary to his severe pain and progressive disability. He was started on haloperidol, 5 mg four times a day, and Elavil, 75 mg at bedtime. The next day there was a marked decrease in the pain. Dilaudid and Demerol were stopped, and the patient received oral Talwin for two days. The Talwin was then stopped, and the patient's pain managed with the haloperidol and occasional Fiorinal.

The patient was discharged in mid-November on haloperidol, 5 mg four times a day, Elavil 75 mg at bedtime, and Fiorinal as needed. When seen two months later in followup, he was pain-free on this regimen. The analgesia afforded this patient by haloperidol was dramatic, both in the rapidity and the degree of response.

DISCUSSION

Our previous reports dealt with patients with carcinoma for whom addiction to a narcotic was of no clinical concern. In the two cases reported here, however, neither patient had a fatal illness; if narcotics were used for analgesia, addiction could be a problem. Use of haloperidol eliminated this potential hazard.

Haloperidol treatment has other advantages: the patient is not obtunded and does not feel "drugged" by the medication. Even in severe pain syndromes, the patient is free from any narcotic effect and may enjoy conversation and other social interactions. Constipation is not a troublesome side effect with haloperidol as it is with narcotics, a benefit that enables patients to be more comfortable, and more satisfied with their treatment.

The development of tolerance is not a problem with haloperidol. While increasing amounts of narcotics may be required for analgesia, at times even requiring that one narcotic be substituted for another, we have never had to increase the dosage of haloperidol to achieve analgesia once we reached the baseline dosage of the drug.

Respiratory depression—a major concern when heavy doses of narcotics are necessary for pain relief—is not a clinical problem when haloperidol is used.

Haloperidol is safe to prescribe even for patients likely to take excessive amounts of medication. It produces no "high," as do narcotics, to entice patients to take more than they need.

The only side effects that must be considered when starting a patient on haloperidol are extrapyramidal symptoms that occur if more than the prescribed amount of the drug is taken. These symptoms may cause muscle and joint stiffness, and possibly oculogyric crises. To avoid these symptoms, we start each patient on Artene, 5 mg twice a day, at the same time we start haloperidol treatment.

Haloperidol can be an analgesic drug in certain patients. In some cases, haloperidol is the only drug needed for analgesia; in others, haloperidol may be used to increase the effectiveness of small doses of narcotic. We believe that haloperidol is a safe, effective mode of treatment that offers distinct advantages over the use of narcotics. There are no problems with potential drug abuse, addiction, development of tolerance, and troublesome narcotic side effects when haloperidol is used.

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Subarachnoid Hemorrhage:

A Headache to Worry About

LCDR Russell C. Packard, MC, USN

Diagnosing the subarachnoid hemorrhage syndrome is usually not difficult. However, two cases seen at the National Naval Medical Center (NNMC), Bethesda, Md., demonstrate that subarachnoid hemorrhage can be mistaken for benign headache.

CASE REPORTS

Case 1: A 47-year-old Marine officer, who rarely had headaches, had the sudden onset of "a severe headache, like an explosion in my head" while taking a shower. The pain was so severe that he dropped to his knees. He went to his local dispensary where the diagnosis of migraine was made and he was treated with a mild analgesic and sent home. Over the next three days he tried to work, but the pain continued with such intensity that he came to the NNMC emergency room.

On physical examination, he appeared ill and had a moderately stiff neck. A spinal tap revealed bloody spinal fluid which was xanthochromic when centrifuged. An aneurysm of the anterior communicating artery was found at angiography, and surgery was successfully performed the following day. The patient had an uncomplicated postoperative course.

Case 2: A 46-year-old woman, who had frequent "tension headaches," felt a "snapping" sensation in her head during a bowel movement, immediately followed by "the worst headache of my life." The pain was severe and throbbing, and was located over the occipital area. The patient went to a nearby naval hospital where she was given a muscle relaxant for her "tension headache and tight neck muscles." She returned to the hospital three times during the following week because of continued pain. A spinal tap was then performed which revealed xanthochromic spinal fluid. She was immediately transferred to NNMC.

During the admission examination at NNMC, the patient suddenly lost consciousness. She slowly improved over the next few days, but on the tenth hospital day she suddenly relapsed into coma and expired. Angiography during her hospitalization had revealed four intracranial aneurysms.

DISCUSSION

These brief case reports illustrate several important points about the typical subarachnoid hemorrhage headache. Both patients experienced the sudden onset of a severe headache that they described as the worst headache of their lives. Both episodes began with a snapping sensation or an "explosion" inside the head. There was also neck rigidity or stiffness (common when blood irritates the meninges), bloody or xanthochromic spinal fluid on lumbar puncture, and continued pain.

Movement usually aggravates the pain, and convulsions may occur in some cases after the onset of the headache. In over half the cases of subarachnoid hemorrhage headache, the pain is accompanied by vomiting, drowsiness, and loss or impairment of consciousness. The absence of these features in the cases described above may have hindered the early diagnosis of subarachnoid hemorrhage.

Subarachnoid hemorrhage headache may be accompanied by fever and an elevated white blood count, raising the question of meningitis. A spinal tap should be performed unless there is papilledema or impending brain herniation.

The most common cause of subarachnoid hemorrhage is rupture of an intracranial arterial aneurysm, which is an abnormal, localized dilatation of an arterial lumen. Approximately two-thirds of the cases occur in patients between the ages of 30 to 60 years (*1*). Most patients are engaged in normal activities when the rupture takes place, although a few ruptures occur during more vigorous activity, such as sexual intercourse.

Subarachnoid hemorrhage is extremely serious. This syndrome is the cause of 2% of sudden deaths (*2*). Death occurs in approximately 45% of patients with each major bleeding episode (*1*); one-third of all patients die within two days of the rupture.

If the patient survives the initial episode, there is a significant risk of rebleeding within the first two weeks. Rebleeding was found at autopsy of the second patient described above.

Reducing the intensity of headache and controlling anxiety, restlessness, and excitement are the immediate therapeutic problems. Codeine, 60 mg every 3 to 4 hours, diminishes the headache; phenobarbital, 32 mg, will help allay anxiety and restlessness, while not significantly altering the state of consciousness. The patient should be transferred to a hospital immediately and placed in the care of a neurosurgeon or neurologist.

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Professional

Current Concepts of the Physiological Mechanism Associated with Proteinuria

LT Karl Doetsch, MSC, USNR

Almost 20 years ago, Grant (*1*) first suggested that glomerular filtrate is not protein-free. There already was strong evidence that normal urine contains small quantities of many different proteins. Now Grant proposed that glomerular filtrate had as much plasma protein as cerebrospinal fluid. He believed that protein is reabsorbed in the tubules and then completely catabolized; the small portion of plasma proteins not reabsorbed is excreted in urine. Protein originating in the urinary tract contributes to the low albumin/globulin ratio normally present.

But the idea that glomerular filtrate has no plasma proteins was not altered easily; Grant's revolutionary proposal for a protein filtration/reabsorption mechanism is still ignored, even though recent work (*2,5-8*) presents overwhelming evidence to support his hypothesis. The inherent biases of laboratory protein methods contribute to this misunderstanding: Qualitative tests for urinary protein routinely are reported as negative for almost all urine samples from healthy people because routine screening tests are not sensitive to low protein concentrations; normal screening methods (acid precipitation, heat and acetic coagulation, and methods based on the protein error of indicators) usually cannot detect less than 200 to 300 mg per liter of total urinary protein. Qualitative and quantitative methods traditionally have been designed to detect only albumin, which comprises less than three-fourths of the protein in normal urine. There are actually many kinds of protein in urine (Table I) (*2*), but most urinary plasma proteins cannot be detected as readily as albumin, and urinary mucoproteins usually cannot be detected at all (*3*). Because of the limits of detection methods, normal total urinary protein concentrations of 3 to 250 mg per liter go unnoticed.

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A healthy glomerular membrane excludes large plasma proteins but admits albumin and smaller proteins; the smaller the molecule, the greater the amount of protein that passes through the membrane. Although the mechanism is unclear, we know that this process does not depend on energy. Following filtration, the proximal tubules reabsorb 99% of plasma protein by pinocytosis (*9*), a nonselective mechanism that is vulnerable to toxic substances because it requires metabolic energy. Efficiency of reabsorption is related inversely to the size of the protein's molecules. For example, 50% of plasma lysozyme (molecular weight 15,000) freely passes the glomerular membrane and then is reabsorbed completely by the proximal tubules. Plasma albumin (mol wt 68,000) appears in the glomerular filtrate, comprising up to 0.1% of the plasma concentration, and is 99% reabsorbed. But plasma lactic dehydrogenase (mol wt 140,000) does not cross the glomerular membrane at all (*5*).

The 180 liters of glomerular fluid healthy individuals produce each day contain 4 to 17 gm of plasma

TABLE I. Some Proteins Found in Human Urine

prealbumin	transferrin
albumin	ceruloplasmin
alpha 1 lipoprotein	Ig G light chains
alpha 1 macroglobulin	Ig G-Fc, Fcl fragments
beta 1A globulin	post gamma protein
beta 1E globulin	3S gamma globulin
haptoglobulin	alpha 1 antitrypsin
hemopexin	fibrinogen
beta trace protein	gonadotropine HCG
alpha 2 bT protein	alpha 2 HS glycoprotein
alpha 2 cT protein	alpha 1 acid glycoprotein
alpha 2 microglobulin	Zn alpha 2 glycoprotein
beta 2 microglobulin	beta 2 glycoprotein I
Gc globulin	uromucoid
glycoprotein	

protein in concentrations of 22 to 94 mg per liter, slightly less than in cerebrospinal fluid. Because the renal threshold is low for protein reabsorption, increased filtration (or decreased reabsorption) quickly causes greater spillover and excretion. For this reason, urinary total protein excretion is the most sensitive indicator of renal disease.

The kidney has been overlooked as an important site of protein metabolism. Ten to fifteen percent of normal albumin catabolism—approximately 2 gm of albumin each day—takes place in the proximal tubules (*6*). More albumin is reabsorbed and catabolized when more protein is present in the glomerular filtrate (*6*). At present, we can only speculate about the fate of reabsorbed plasma protein. There is evidence that protein endocytosis vacuoles fuse with tubular lysosomes containing proteolytic enzymes. Hydrolysis produces constituent amino acids, some of which are used to synthesize new proteins while the remainder return to the plasma (*6*). Other evidence suggests that intact proteins enter the lymphatic system from the tubules by exocytosis and return to the plasma through the thoracic duct (*5,6*). Reabsorbed protein probably takes several routes: Part of the reabsorbed protein probably is catabolized to amino acids, some of which are used to synthesize new protein while the rest return to the plasma. Some of the larger reabsorbed proteins may enter the lymphatic fluid, while smaller proteins and peptides may return to the plasma directly by way of a favorable concentration gradient.

SOURCES AND NATURE OF URINARY PROTEINS

Urinary proteins can come from several sources:

- Unabsorbed plasma protein accounts for 50% ± 25% of the normal urinary protein, with albumin predominating. More plasma protein is excreted if the glomerular membrane becomes more permeable, or if the proximal tubules are not functioning properly, or if both conditions exist simultaneously.
- Mucoproteins synthesized on the outer surface of the cells that line the nephron and urinary tract make up most of the remainder of urinary protein (*6,9*). Although the function of these proteins is not known, they appear to be involved both in normal lubrication and in inflammation of the genitourinary tract. When inflammation occurs, mucoprotein synthesis and excretion may increase.
- Normal replacement of cells releases intracellular proteins into the urine. Although the amount of these proteins is small, they may be identified selectively during increased metabolic activity—in carcinomas, for instance.
- Foreign proteins may increase during gross microbial infections.
- In rare cases, lymphatic drainage into the urinary tract can result in the presence of unusually large globulins and lipoproteins.
- Dysproteinemia can result in specific proteins or protein fragments, Bence-Jones protein being the well-known example.
- Finally, blood cells, prostatic fluid, vaginal secretions, and intestinal conduits can contribute unpredictably to the spectrum of urinary proteins.

The great diversity of urinary proteins causes subtle problems in chemical analysis, and the variety of sources makes it difficult to interpret the resulting data.

The different normal ranges reported in the literature (Table II), and the fact that some medical texts still describe urine as a protein-free fluid, illustrate that the lack of reliable data causes misunderstanding of renal protein physiology. For healthy adults, the range of urinary total protein excretion at 95% confidence limits is 82 to 207 mg (*4*).

Figure 1 shows a frequency distribution for a sample population of 80 men, ages 22 to 45 years, and 5 women, ages 22 to 29 years. A primary gaussian distribution overlaps the curve of a minor subgroup—probably young men with a mild, benign increase in glomerular permeability, reflecting normal vigorous activity. The minimum protein excretion was 82 mg. There was no significant variation because of age or sex. Increases greater than 100% above the upper limit of the normal range are unusual, even in persons performing moderate physical exercise or experiencing emotional stress.

SIGNIFICANCE OF PROTEINURIA

During heavy exercise, protein excretion can increase up to six times the normal amount—a condition call *functional proteinuria*. Because the proteins come from plasma, this increase may be caused by a change in glomerular permeability (*9*). Some investigators (*5*) suggest that increased plasma epinephrine constricts the afferent arterioles, retards renal blood flow, and subsequently decreases the glomerular filtration rate, permitting greater diffusion of proteins into Bowman's capsule. When normal blood flow returns, the excess protein washes through the system and collects in the urine. Other researchers (*5*) propose that decreased renal blood flow in the peritubular capillaries diminishes

the reabsorption threshold, resulting in increased spillover.

In *postural proteinuria*, protein excretion in the standing patient can increase 12 times over protein excretion when the patient is lying down. *Orthostatic proteinuria* results in even larger increases. The physiological mechanisms causing these increases are obscure, but minor changes in glomerular permeability apparently occur (*5*).

Elevated concentrations of plasma proteins (mol wt less than 70,000) can result in *prerenal proteinuria* when increased filtration and a low reabsorption threshold produce greater protein spillover. For example, albuminuria occurs when the plasma albumin concentration increases because of infusion (*5*). After haptoglobin becomes saturated, free plasma hemoglobin enters the glomerular filtrate and appears in the urine. Myoglobin appears after traumatic injury, while Bence-Jones protein reflects dysproteinemia.

The renal filtration/reabsorption mechanism clearly selects proteins according to size. A healthy glomerular membrane allows only proteins with small molecules to enter the glomerular filtrate, but tubular reabsorption is a nonselective process. Therefore, tubular impairment without glomerular damage results in *selective proteinuria* where increased amounts of albumin and smaller proteins are present in the urine. Protein excretion, however, rarely exceeds 2 gm per day (*5*).

In the opposite condition—glomerular damage without tubular impairment—we find a *nonselective proteinuria* where albumin and larger proteins predominate in the urine and more than 2 gm of protein are excreted daily. This condition is temporary because, when protein concentration in the glomerular fluid remains high, the overburdened proximal tubules soon malfunction.

When glomerular damage and tubular damage exist at the same time, the urinary protein spectrum is nearly identical to the protein composition of plasma. In this condition, called *gross proteinuria*, protein excretion sometimes exceeds 20 gm per day (*5*).

The clinical conditions associated with various types of proteinuria were reviewed by Rennie (*9*) in 1971.

TABLE II. Comparison of Data for Normal Urinary Total Protein Excretion

Date	Source	Method	Mg/Day
1958	King, et al.	Kjeldahl (corrected)	204
1967	Joergensen	Gel filtration/Lowry	84–157
1968	Beeson & McDermott		40
1969	Lippman	Shevky–Stafford	60
1969	Lynch, et al.		10–100
1970	White, et al.	Shevky–Stafford	20–80
1970	White, et al.	Mucoprotein	85–170
1970	Tietz	Turbidimetric	50–150
1970	Manuel, et al.		5–31
1970	Manuel, et al.		10–150
1970	Manuel, et al.		24–133
1970	Sunderman & Sunderman	Refractometry	30–50
1970	Sunderman & Sunderman	Biuret	42–53
1970	Sunderman & Sunderman	Biuret	40–150
1970	Sunderman & Sunderman	Lowry	90–168
1970	Sunderman & Sunderman	Lowry	22–130
1970	Sunderman & Sunderman	Lowry	88–300
1970	Sunderman & Sunderman	Lowry	85–158
1970	Sunderman & Sunderman	Lowry	77–268
1970	Sunderman & Sunderman	Lowry	38–394
1970	Sunderman & Sunderman	Bromphenol blue	9–80
1970	Sunderman & Sunderman	Kjeldahl	2–190
1971	Rennie		Less than 150
1972	Pitts		100
1974	Bauer, et al.	Picric acid PPT	24–70
1974	Doetsch & Gadsden	Modified biuret	82–207

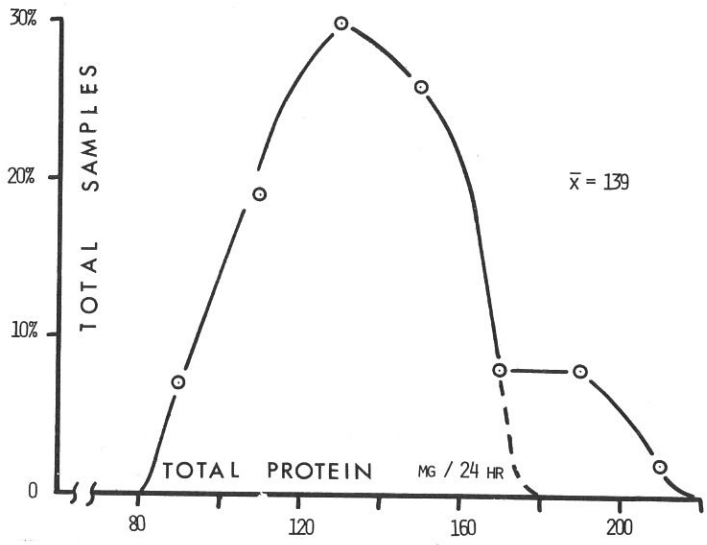

FIGURE 1. Frequency of normal urinary total protein excretion.

POTENTIAL DIAGNOSTIC AID

Modern technology and proper sampling can overcome most of the difficulties in urinary protein analysis. Detailed information about renal function can be gained from differential determination of specific urinary proteins and protein clearances (*8-18*). Comparative disc gel electrophoresis (*11*) and selective immunochemical methods (*12-14*) are other useful laboratory tools. Urinary enzymology identifies proteins by size and yields specific information about renal cellular damage (*16-18*). For instance, when the proximal tubules become impaired, the activity of urinary plasma lysozyme increases. If glomerular damage has occurred, plasma lactic dehydrogenase appears in urine. Furthermore, the presence of lactic dehydrogenase and alkaline phosphatase of renal origin indicates that the study of renal isozymes may be a valuable undertaking (*18*). Urinary enzyme patterns, however, should be studied cautiously because sampling and methodological requirements are demanding. For example, it is important to remove interfering substances before testing, to achieve analytical reliability (*4,18*). Eight-hour overnight sampling is necessary, and kinetic methodologies are desirable.

New laboratory methods combined with a knowledge of the renal mechanism for protein filtration and reabsorption should provide an additional tool to study and manage renal disease.

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DON'T MISS

Women Succeed as Navy Paramedics

Women hospital corpsmen and dental technicians in the Navy are as effective as their male counterparts, report Evelyn G. Webster and Richard F. Booth in "Success and Failure Among Male and Female Navy Paramedical Specialists." Their findings contradict earlier data showing that women had higher discharge and lower reenlistment rates than men.

Booth and Webster tested some 4,300 men and women who entered Hospital Corps and dental technician training between February and August 1973. The results: trainee quality, measured by background, aptitude and personality characteristics, was similar for men and women. An equal number of these women and men completed paramedical training and were on active duty one year later. Among those who failed to complete Hospital Corps training, more women than men were still in the Navy one year after leaving school.

These findings suggest that traditional women's roles and Navy policies toward women have changed significantly in the past ten years, the researchers say. The study, Report No. 75-26, is available from Naval Health Research Center, San Diego, California 92152.

Treatment of Infrabony Osseous Defects by Grafting: A Review of the Literature

I: Early Research and Experimentation

CDR Gordon B. Groff, DC, USN

Periodontists are constantly confronted with the problem of how to treat infrabony osseous lesions. Before autogenous cancellous bone and marrow implants were performed by Schallhorn (*1*) and Dragoo (*2*), osseous defects were treated in various ways, including "resection" as described by Schluger (*3*), Ochsenbein (*4*), et al, and "new attachment" procedures as described by Prichard (*5*). Recently, attention has focused again on regeneration of alveolar bone—a more desirable alternative than eliminating pocket depth by resection techniques. The optimal therapeutic goal is formation of a new attachment composed of new cementum, periodontal ligament, and supporting alveolar bone.

This paper reviews the literature pertaining to the elimination of osseous and soft tissue pockets. Part I covers early research and experimentation with grafting to treat infrabony osseous defects. In Part II, I will discuss recent research on autografts and homografts, and the application of this work to clinical practice.

EARLY RESEARCH

The earliest research in osseous grafting includes Beube's classic work using boiled cow bone powder (*6*) to treat infrabony pockets, 7 mm or more deep, which were located around single-rooted teeth and did not respond to curettage. Bone powder grafts were contraindicated where the pocket orifice was wide and the gingival tissue deficient either in amount or quality.

Beube describes the procedure:

> On the day of the operation, a fresh marrow bone of 3-inch length is obtained from the butcher shop. The bone should be compact and noncancellous. After stripping off the periosteum, the cortex is ground with a large vulcanite bur in a lathe. The fine powder is gathered in a towel and secured with elastic before it is placed in boiling water for 10 minutes. Sterile fibrin foam (which serves as a binder) and thrombin (which aids in clotting and graft retention) is added to the moist bone, yielding a pasty mass ready for use.

The roots were scaled and soft tissues were curetted three to six months before the grafting procedure, to remove epithelium and granulation tissue within the pocket walls. If the pocket was not eliminated by curettage, the operator may at least have reduced tissue inflammation, a necessary step to aid tight closure over the grafted material. After raising full-thickness flaps, the operator mixed the bone graft with blood and packed the mixture lightly in the defect. A piece of fibrin foam or powdered beef plasma was used to cover the graft before the operator placed interrupted sutures. A radiographic picture of bone deposit was obtained four to six months postoperatively. Beube concluded that boiled cow bone powder provided mineral salts and other ingredients essential for bone healing and regeneration, thus preventing fibrous healing.

In 1956, Forsberg (*7*) described the use of "os purum," a ground ox bone graft prepared by a complicated physicochemical procedure that removed fat, connective tissue and protein. Forsberg claimed defects were eliminated in 8 of the 11 patients he treated with this material.

About the same time, Cross (*8-10*) published several reports on the use of bone implants, advocating curettage of root surfaces and soft tissue walls to prepare the mouth. Mobile teeth were splinted before the operation. A conventional flap approach was used. Following complete debridement and curettage of the defect, bone fragments were moistened with saline or a dilute penicillin solution (400 units/ml), and placed up to the highest level of the surrounding bone. The tightly sutured flaps were covered with tin foil and a surgical dressing contain-

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ing Terramycin. Prophylactic penicillin was given for four days after surgery. In 66 implants, Cross reported 37 good results, 14 fair results, and 15 poor results.

In 1958, Schaffer (*11*) reported on 70 cartilage homografts implanted in 26 patients. Pocket depths ranged from 3 mm to 12 mm. Schaffer's technique involved partial gingivectomy with thorough root planing and curettage. Schaffer reported new attachment in 60 of the 70 grafts, varying 0.5 mm to 6 mm coronal to the preexisting attachment; in 55 of the 70 grafted areas, the average postoperative sulcular depth was 3 mm or less.

As early as 1955, Weinmann and Sicher (*12*) reported that autogenous bone transplants gave the most favorable grafting results, especially if part of the transplant could be kept "alive." Nabers and O'Leary (*13*) investigated autogenous bone chips, removed during osteoplasty and ostectomy, as a graft material. Preliminary scaling and root planing, occlusal adjustment, and antibiotic therapy were prescribed. Donor bone was obtained from the patient's maxilla or mandible at surgery. Osteoplasty was accomplished with bur or chisel, and the removed bone was placed in 0.9% isotonic saline solution. Graft particles were packed loosely into the defect up to the bony crest before the flaps were tightly sutured. Protective surgical dressings were changed weekly for three to five weeks; no attempt was made to probe the area for six months.

Nabers and O'Leary limited their research to one-walled or two-walled osseous defects. Postoperative radiographs showed marked coronal increase in bone height in all cases, but no attempt was made to document new attachment by histologic means. This study stimulated further research with autogenous grafts, and is the cornerstone of the more sophisticated research of the 1970's.

In the search for new graft materials, Radentz and Collings (*14*) experimented with plaster of Paris to treat infrabony defects (the concept dates back to 1928, when it was first used to treat orthopedic defects). Using the dog as experimental model, Radentz and Collings sacrificed animals for analysis at intervals of 3, 4, 5, 6, 7, 8, and 12 weeks postoperatively. Ordinary plaster of Paris, sterilized at 250° F. for 30 minutes and mixed with sterile saline until thick, comprised the graft material.

Radentz and Collings postulated that curettage procedures failed when used to treat certain types of infrabony defects because the epithelium proliferated apically faster than connective tissue proliferated coronally. They believed that inserting plaster of Paris after debridement might prevent the epithelium from growing downward, while the plaster of Paris simultaneously was absorbed in the depths of the defect, permitting unhampered regeneration of new bone and connective tissue. In all cases, the investigators noted no foreign body reaction, excellent tolerance, and complete resorption of the plaster grafts by the sixth week.

Histologically, regeneration of alveolar bone, both in control and experimental lesions, seemed to be controlled chiefly by the presence or absence of inflammation. Pockets with mass invasion of inflammatory cells had deep epithelial invasion and little deposit of new bone even eight weeks after surgery. Wounds that healed by first intention showed new bone deposit by the second week. Early wound healing of the plaster-filled defects was distinguished by well-oriented connective tissue fibers covering organized, regenerating bone, with little epithelial invasion. In control samples, disoriented collagen fibers covered a more ragged bony deposit, with epithelium proliferating apically along the root. All plaster and control wounds healed by the sixth week, with identical radiographic and clinical appearances.

Later, Shaffer and App (*15*) tended to discredit the effectiveness of plaster of Paris. They, too, reported rapid resorption of graft material with no evidence of inflammation or rejection; however, they did not note any appreciable osteogenesis. Absorption and remodeling altered the bony contours until they were clinically acceptable in many cases. After six months, new connective tissue attachment was seen which may have been enhanced by the plaster of Paris, a finding consistent with that of Radentz and Collings. Shaffer concluded that most areas healed uneventfully with an acceptable reduction of sulcular depth, and that interdental bone heights were more radiopaque after six months. The major contradiction to the work of earlier investigators was the finding that plaster of Paris did not induce or stimulate new bone formation in the defects. Use of plaster of Paris in treating osseous defects has since waned.

BONE AND CEMENTUM FORMATION

Stallard and Hiatt (*16*) in 1968 began histologic studies to determine factors responsible for forming new bone and cementum in dogs. They observed how the healing process was affected by tooth and bone fragments remaining under a flap after surgery. Mucoperiosteal flaps with full gingival retention were elevated over the facial aspect of maxillary

canines in 16 dogs. The alveolar margin was reduced and the roots planed to remove the exposed cementum. Flaps were replaced and sutured; the animals were given prophylactic antibiotics, and sacrificed at intervals of 1, 2, and 3 weeks, and 1, 4, 6, and 12 months.

When small amounts of vital cementum and periodontal ligament were retained on the root surface, repair of the flap appeared to be accelerated at one week. Although repair following alveolar surgery is unusually rapid in dogs, several important observations were made: Fragments of cementum were found imbedded in more than 1 mm of new bone at the end of two weeks; this was considerably more bone than had formed on the alveolar margin where no fragments were found, suggesting the fragment's possible role as an inducer of bone formation. At four weeks, exposed dentin on the planed root appeared scalloped because of resorption along its entire surface under the flap. Osteoid had surrounded both dentin and cementum fragments, and a newly forming periodontal ligament could be seen. At four months, the epithelial attachment had regenerated; new cementum covered the dentin of the planed root, but the root retained its scalloped, resorbed appearance. Cementoid or osteoid formation, seen around cementum fragments at the end of two weeks, increased in the third and fourth week. Cementum hyperplasia occurred at the apical zone of the root planing where no fragments were observed, suggesting an additional induction mechanism related to the surgery. Stallard and Hiatt (*16*) concluded that bone, cementum, and dentin chips remaining in the wound after periodontal flap surgery serve as nidi for or inducers of new bone and cementum formation.

Morris (*17*) continued research on dentin and cementum, introducing autogenous bone and marrow into the abdominal subcutaneous tissue of female white rats. Histologic evaluation of sections taken at 1, 2, 3, 4 and 6 weeks postoperatively, and at 2, 3, 4, 6, 8, 12, and 18 months postoperatively suggested that the juxtaposition of bone, red marrow, and root did not enhance the formation of new cementum. Morris concluded that bone formation near a root (as induced by a bone graft) might hinder cemental apposition. The presence of root, in turn, seemed to delay the formation of red marrow, since it took four months instead of the usual two months for hematopoietic elements to become complete. The bone-root fusions noted at six months may be attributed to a "bone inductive principle" in the root, or to similarities in collagen matrix and apatite crystallization in bone and teeth. Morris also suggested that when the root surface is found in an area of marked bone formation, the bone-forming elements regard the root as bone and subject it to a substitution-replacement process, as in ankylosis. Under normal conditions, the healthy, functioning periodontal membrane prevents such a fusion.

In his second study, Morris (*18*) examined the effect of two decalcification methods on the inductive potential of dentin and cementum. The roots of caries-free rat teeth, exhibiting little or no bone loss, were cut, nicked, and preserved at -5° C. In the first experiment, the roots were decalcified in 0.6% normal hydrochloric acid and subsequently implanted in the subcutaneous tissue of rats. The nicks were invaded by a highly vascular connective tissue within the first week; by the third week, resorption and excavation of the dentin had begun, with accumulation of plasma cells and lymphocytes filling the nicks and invading the tubules of the dentin. Recalcification of dentin began in the third month, leaving a well demarcated zone by one year. No new bone formation was noted.

In the second experiment (*18*), the roots were decalcified in 5% normal ethylaminediamine tetracetic acid and placed with fresh autogenous marrow in the subcutaneous tissue of rats. Vascular connective tissue was found in the nicks at one week; by the second week there was a marked recalcification of dentinal matrix with an overlying deposit of new bone. At four weeks, osteoid and new bone grew on the dentin surface.

Morris concluded that the environment rather than the method of decalcification determines whether or not bone will form on cementum. The experimental data suggest that dentin and cementum encourage the deposit of bone only in environments where bone would easily form without them. Histologically, this means that dentin and cementum cannot induce mesenchymal cells to differentiate into osteoblasts; rather, the environment supplies the osteoblasts, or other cells that can differentiate into osteoblasts, as a response to certain stimuli. Under proper conditions, root surface might convert osteoblasts to cementoblasts, accounting for the formation of bone on implants (decalcified or not) in the periodontium, alveolar crest, marrow cavity, and experimental animal. Such inductive processes would presumably be chemical, and Morris concluded that dentin and cementum are not active chemical promoters of osteogenesis. Thus Morris claimed that the root (dentin) does not contain a "bone inductive principle" as previously proposed by Urist (*19*) and

his co-workers. It is possible that dentin and cementum may act only as co-inducers, with adjacent activity responsible for growing bone. Hematopoiesis was observed by the fourth week in Morris' earlier experiment (*17*) using marrow and undecalcified root, but not until the eighth month in the second study, using marrow and decalcified root; this result suggests that undecalcified root is more favorable for hematopoietic development.

A repeated finding of the second study was recalcification of dentin under newly forming bone, but it is not known whether calcified dentin is a prerequisite to new bone formation, or whether the attraction of calcium salts by the new osteoid "spills over" and recalcifies the underlying dentin.

In summary, Morris noted that cementum and dentin decalcified by hydrochloric acid did not induce new bone in the subcutaneous tissues of the rat, while cementum and dentin decalcified by ethylaminediamine tetracetic acid did produce new bone when implanted with autogenous marrow.

Morris' third study (*20*) involved implants of homologous bone with root, homologous bone and autogenous marrow, decalcified homologous bone, and decalcified homologous bone with autogenous marrow. Results showed that homologous bone alone, preserved by freezing, did not induce bone growth in the subcutaneous connective tissue of the rat; decalcified bone, stored frozen, did induce new bone and ossicle formation, but to a much lesser degree than fresh autogenous bone, and with no marrow being produced. This suggests that osteocytes are not the only inducers in bone: there may be several inducers, including cellular or intercellular components of undecalcified bone, as well as the acellular organic matrix. Decalcified bone alone produced ossicles with reticular networks, but no marrow. Decalcified bone with marrow produced both ossicles and new marrow appearing after complete calcification of the inner ossicle surface. When autogenous marrow was implanted with homologous frozen bone, ossicles formed as with fresh material, but the process took 12 months instead of several weeks. Morris believed that homologous frozen bone was a favorable companion for marrow in bone development, but not as strong an inducer as fresh autogenous bone.

Of the four combinations Morris investigated, only frozen homologous bone with marrow resulted in osseous growth in areas of root resorption. However, the potential differences between the bone-inducing qualities of human dentin and those of animal dentin must not be overlooked when data from one experimental model are applied to the other. This may account for differences between Morris' findings and those of Urist, who earlier reported bone induction with implanted decalcified animal dentin. It is likely that animal dentin has a bone-inducing principle not present in human dentin.

Although many researchers believe bone marrow and cancellous bone to be the most desirable donor materials for implantation, there is considerable evidence that other mineralized particles, such as cortical chips, dentin, cementum, and cartilage, may stimulate bone formation as well. The work of Schaffer, Stallard and Hiatt, Nabers, and others has previously been discussed.

OSSEOUS COAGULUM TECHNIQUE

Robinson (*21*) proposed the use of "osseous coagulum" for bone induction. While predictability had yet to be established, this approach to the treatment of infrabony lesions provided a useful technique for routine clinical practice; it did not require the auxiliary personnel or hospital facilities needed for iliac crest autograft procedures. Previous investigations, such as those of Ratcliff (*22*), had shown that the donor tissue provides a network of slowly resorbed surfaces upon which new bone grows. Ratcliff believed that the size of the graft material may be significant if the donor material must be completely resorbed before new bone is formed.

Robinson noted that sequestration sometimes occurred when larger particles of bone were used, as in previously documented cases, and that it was often difficult to obtain bone marrow and adequate quantities of cancellous bone intraorally. He proposed the use of bone obtained from areas where therapy included osseous correction, such as the removal of lingual ridges, or from exostoses or the distal surface of a terminal tooth or edentulous area. Osseous surgery was performed with a #6 carbide bur at a speed not exceeding 30,000 revolutions per minute; the accumulated bone dust was mixed with blood (a lubricant and coolant) to form a coagulum. At no time did the "osseous coagulum" leave the site. Coagulum was collected with a spoon-shaped curette, and the defect filled by alternately packing the area and drying it with a small gauze pad. After the defect was overpacked with a solid bulk of coagulum (believed helpful in providing a biological bandage, this overpacking is eventually lost), the wound was sutured, and compressed with wet gauze pads. Dry foil was placed over the teeth and covered with periodontal dressing. The patient was placed on tetra-

cycline, 250 mg, four times a day for four days. When the patient was rehospitalized after four months, reentry into the wound showed the osseous repair to have a pebbly appearance. Robinson reports consistently good results in cases treated by this technique, including some furcations. More investigation is under way to establish limits of predictability.

Diem, Bowers and Moffitt (*23*) noted some disadvantages in the Robinson technique: Because the operator cannot routinely aspirate the area, coagulum accumulates and often masks the surgical field. Also, because bleeding from the intramarrow penetration makes the flowing material difficult to transfer, the coagulum can be lost by aspiration or seepage. These researchers proposed triturating larger bone fragments in a sterile capsule and pestle to form a workable plastic mass. This "bone blending" technique uses bone fragments from extraction sockets, exostoses, or other intraoral sites. Bone is placed in a sterile capsule along with a drop of sterile saline, and triturated for 60 seconds. The "bone blend" is then removed from the walls of the capsule and pestle with a spoon-shaped curette. The osseous mass, similar to slushy amalgam, can readily be packed into osseous defects.

More recently, Hutchinson (*24*) used a sterile disposable filter unit as an adjunct to collecting osseous coagulum by Robinson's technique. The filter membrane is replaced by a sterile amalgam squeeze cloth, cut to fit. The squeeze cloth retains aspirated bone particles and permits the irrigating solution to pass through it. Standard aspiration tips can be attached to the filter with latex tubing. Routine irrigation and aspiration are maintained during osseous reduction to ensure that the minute coagulum particles are not lost, and to maintain visibility in the surgical field. When the osseous reduction is complete, saline is flushed through the filter system to condense the coagulum.

In studies comparing osseous coagulum and osseous retrograde grafts in rhesus monkeys, Rivault (*25*) concluded that bone grafts should be completely covered by soft tissue flaps, since the gingiva's connective tissues seemed to be an important source of the capillaries and undifferentiated mesenchymal cells that invade defects during repair. As granulation repair tissue organizes, many cells show intermediate stages between undifferentiated types and fibroblasts. It is highly probable that the mesenchymal cells are the source of many specialized cellular elements; since these cells invade the graft through the large openings of the osseous defects, the need for retaining mature, well vascularized connective tissue over the site is obvious. Goldhaber (*26*) demonstrated an "induction phenomenon" in which osteoblastic differentiation occurred around graft particles when mesenchymal cells were present. Two types of stimuli may be responsible: diffused tissue metabolites, which in turn act as an osteogenic factor; or the mineralized constituents of the graft particles, which may act as inductors (see also Linghorne [*27*]).

Rivault observed that the smaller bone chips used in the osseous coagulum technique provided a more rapid osteogenic stimulus than larger bone particles, since induction appeared to occur by contact with graft material. It was also important to control irritation, Rivault said, since crestal bone healing was delayed when chronic inflammation persisted. The graft material underwent necrosis and its components appeared to build new bone: bone resorption in the center and apposition in the periphery of graft particles were noted on histologic examination. Some delay in bone formation was observed around the larger particles, indicating that particles larger than 1 mm might act as irritants and be rejected (see also Cross [*8*] and Robinson [*21*]).

In 1969, Halliday (*28*) described a two-stage method for obtaining newly formed bone from a surgically created wound in the mandible. A mucoperiosteal flap is reflected at the donor site—that is, an edentulous area of the mandible. A hole is made in the mandible with a trephine, cortical bone is removed and discarded, and the flaps are replaced and sutured. Six or seven weeks later, during definitive surgery, full-thickness flaps are raised and all remaining granulomatous and pocket epithelium is eliminated at the recipient site. Again, the mucoperiosteal flap is raised at the donor site; the tissues within the healing wound are removed with a small spoon curette and packed firmly into the periodontal defect to the coronal height of bone. All flaps are tightly sutured, and covered with dry foil and a periodontal dressing that is changed each week for three to four weeks. Although Halliday's results were inconclusive, he pointed out another way to procure cancellous graft material from the oral cavity.

Cushing (*29*) believed there were four possible means by which autogenous red marrow grafts stimulate bone formation: bone fragments retained within the grafts; endosteum not separated from the marrow; the marrow cells themselves; and tissues at the grafting site. Since Burwell (*30*) and others noted that new bone formed around a bony spicule in only 1 of 13 successful red marrow autografts, bone frag-

ments by themselves are no longer believed to play an important role in forming new bone. Endosteal cells, too, probably are not important: when Bloom (*31*) prepared a core sample of red marrow free of endosteal cells, new bone formed in response to red marrow grafts. Many researchers worked with the marrow cells themselves, believing that the primitive reticular cells could differentiate into osteoblasts. Levander (*32*) believed that osteogenic cells might be derived from tissues at the grafting site; he said the implanted necrosing marrow liberated osteogenic substances that stimulated mesenchymal cells at the periphery of the transplant in the recipient site. But Burwell (*30*) reported that marrow autografts, devitalized by liquid nitrogen, did not form bone—thus discrediting the "recipient site" theory.

Certain marrow cells appeared to be implicated as the source of osteogenesis in autografts. Lining the sinusoids of marrow were primitive reticular cells (also called "littoral cells," see Maximov [*33*]) which have phagocytic properties and form part of the reticuloendothelial or macrophage system. Other connective tissues contain cells that also may have osteogenic potential, but of much lower magnitude; Ham and Harris (*34*) mention macrophages, fibroblasts, endothelial cells, or primitive reticular cells.

Burwell found evidence within marrow of a specific stimulus to osteoblastic differentiation that is liberated by marrow necrosis. In other words, transplanted marrow produces bone because osteogenic substances, liberated from the necrotic part of the marrow, induce osteoblastic differentiation in the surviving marrow's primitive cells. Most recently, Goldhaber (*26*) suggested that osteogenic induction occurs by diffusion. Moss (*35*) suggested that the osteogenic inductive substance is a mucopolysaccharide such as chondroitin sulfate or other protein mucopolysaccharide.

Necrosis apparently determines osseous response to marrow grafting. Burwell (*30*) noted that conditions which favor extensive necrosis of marrow—such as autogenous marrow contained within cancellous bone away from a source of nutrition—promote bone formation. Autografts transported to highly vascular regions where survival of cells is favored do not generally form bone. This result implies that necrosis releases substances which induce cells to differentiate into active osteogenic cells.

If osteogenic inducers are present in marrow, Burwell believes they are most likely to be found in the cells that line the medullary sinusoids, namely the reticular or littoral cells. Burwell concludes that the high osteogenic potential of marrow is determined by the extent of graft necrosis, the concentration of breakdown products in the necrotizing littoral cells, the uptake of such substances by released primitive wandering cells, and the potential of these cells for osteoblastic differentiation. Combination grafts (marrow plus cancellous bone, or homologous cancellous bone with marrow removed) may form new bone through the same mechanism. Burwell claimed that for osteogenesis to occur undifferentiated cells must contact necrosing bone elements, thus inducing the primitive cells to become osteoblasts; grafts amplify this process because more necrosing bone surface is exposed to the red marrow.

As has been shown, pure marrow autografts can meet several fates after transplantation, including resorption, formation of connective tissue collagen or cartilage, and so forth. Some researchers speculate that the autograft's fate depends upon factors present at the recipient site and specific to it.

According to Williams (*36*), certain conditions must be met to ensure bone formation: trauma must be minimal; grafts must be of a certain size in relation to the host region; grafts must be on host vessels but not among them; grafts must not be compressed, but rather should have a thin, fluid-filled spore into which to grow.

These hypotheses give us a better basis to analyze and interpret the clinical data. But until additional histologic research becomes available, the dynamics of marrow graft wound healing, and the ultimate fate of the graft itself remain obscure.

Part II of this paper will appear next month in U.S. Navy Medicine.

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DON'T MISS

Serological Survey of Antibodies to Respiratory Viruses on Taiwan

Investigators at Naval Medical Research Unit No. 2, Taiwan, have completed a serological survey of antibodies against viral agents suspected to cause acute respiratory infection (ARI).

G. Chin-Yun Lee and Yun-Tsung Huang analyzed sera collected from 23 adults and 173 children from April 1967 through April 1968. They determined neutralizing and hemagglutination-inhibition (HI) antibody titers against respiratory syncytial virus, parainfluenza viruses types 1 through 3, influenza type A2/HK/68,* and type B viruses.

The low incidence of positive antibody against types 1 and 2 parainfluenza viruses, and the prevalence of antibody against parainfluenza type 3 and influenza type B viruses support previous findings that parainfluenza type 3 and influenza type B are the most common myxoviruses in the respiratory tracts of Taiwanese children with ARI. Neutralizing antibody against respiratory syncytial virus was found in 46% of sera from 6-month-old children, 90% of sera from 5-year-old children, and all adult sera and cord bloods; this suggests that, in Taiwan, respiratory syncytial infections are as common in children aged 0-5 years as they are in this age group elsewhere.

Antibodies against parainfluenza type 2 were present in only 16 of 193 specimens (8.3%), all from children under the age of 10 years. Distribution of parainfluenza type 3 antibodies was similar to that of respiratory syncytial virus antibodies.

Antibodies against influenza B were present in all adult and cord blood specimens. The prevalence was approximately 85% in infants from 3 to 6 months old, and 95% in infants 12 months old. Distribution of antibodies against influenza A2/HK/68 was similar to distribution of influenza B antibody, except that only 70% of children over age 10 had significant titers. This suggests that influenza strains closely related or even identical to A2/HK/68 were prevalent in Taiwan before the 1968 outbreak of this infection in Hong Kong.

"A Serological Survey of Antibodies to Selected Respiratory Viruses on Taiwan" is available from the Publications Office, NAMRU-2, Box 14, APO San Francisco 96263. Ask for Report No. TR-667.

*A/Hong Kong/8/68 (H3N2)

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